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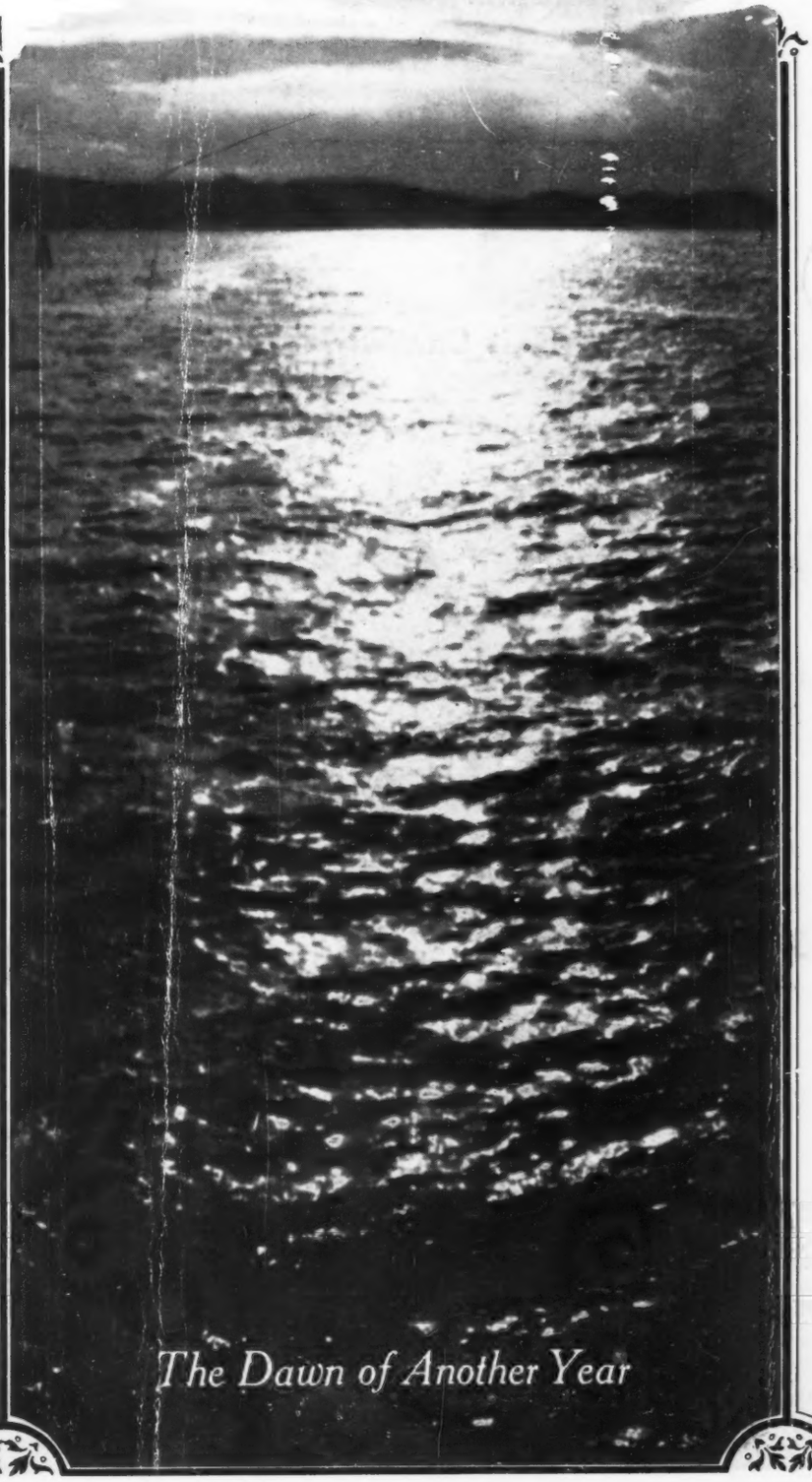

The Dawn of Another Year

Surface Energies in Flotation
By Frederick G. Moses

The Minerals of Madagascar
By George F. Kunz

Engineering in Japan
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Sketch of
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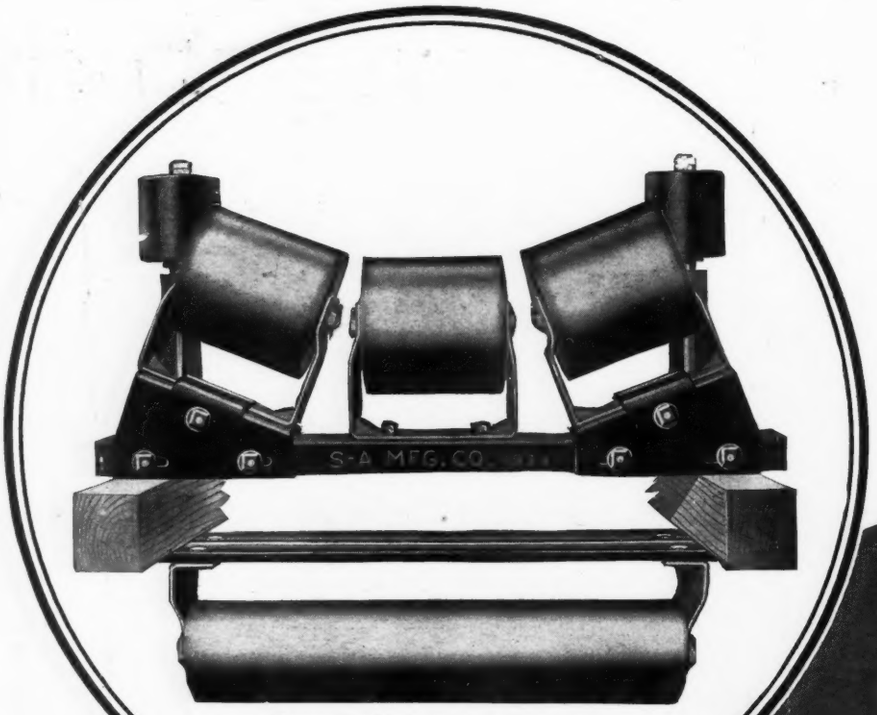

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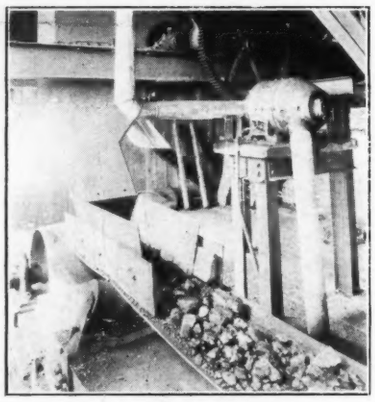

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"Now that the Rebellion is overthrown, and we know pretty nearly the amount of our National debt, the more gold and silver we mine we make the payment of that debt so much easier."—*Abraham Lincoln, April* 14, 1865.

"Their Prosperity Is the Prosperity of the Nation"

A FEW HOURS before Lincoln was assassinated, he sent to the miners in the West the message printed above, which, like all of Lincoln's utterances, reads like an inspired message to posterity. Lincoln was not an economist, nor yet a banker. He knew a shinplaster for what it was worth as paper and as a temporary I O U to make-shift through a period of poverty. His message continued:

"Now I am going to encourage that in every possible way. We shall have hundreds of thousands of disbanded soldiers, and many have feared that their return home in such great numbers might paralyze industry by furnishing, suddenly, a greater supply of labor than there will be demand for. I am going to try to attract them to the hidden wealth of our mountain ranges, where there is room enough for all. Immigration, which even the War has not stopped, will land upon our shores hundreds of thousands more per year from overcrowded Europe. I intend to point them to the gold and silver that wait for them in the West.

"Tell the miners for me that I shall promote their interests to the utmost of my ability; because their prosperity is the prosperity of the nation; and," said he, his eye kindling with enthusiasm, "we shall prove, in a very few years, that we are indeed the treasury of the world."

Our statesmen today would do well to ponder upon Lincoln's financial policy, and his clear conception of what constitutes money and the solid basis of finance. His words constitute a recommendation of the McFadden Bill now asking the action of Congress, and designed for the stimulation of our gold production. If our Government will now take this means to artificially stimulate a waning gold production which has been artificially diminished by the vast issues of paper money, and will take steps to see that the gold so won is not converted into jewelry, and thus hoarded so as to be useless to our finances, it will be working in the most efficient way toward a return to sound conditions, stable instead of chaotic prices, a firmer basing of commodities and wages on the law of supply and demand, and the quieting of industrial unrest. So long as we do not clearly see that a healthy condition of our finances and the world's finances depends on *less paper and more gold and silver,* we shall be treading a confused path on which the clear sight of Lincoln would not have allowed him for a moment to venture.*

*The quotation is from "Lincoln's Yarns and Stories," by A. K. McClure, and was called to our attention by Mr. H. K. Jackson, of Cleveland.

The Use of Lobbies

SENATOR THOMAS, of Colorado, in a speech before the American Mining Congress in Denver, said that there were one hundred and twenty-five organized lobbies in Washington, of which the Mining Congress was one. We do not think he meant more than at most a humorous complaint in this statement, nor do we believe that it was resented by the officials of the Mining Congress.

The Federated American Engineering Societies, in their headquarters at Washington, plan, in the same sense, to carry on an organized lobby at the doors of Congress and the rest of the Federal Government. As the Mining Congress plans to furnish information to our Federal legislature concerning the conditions in the mining industry, and bring the necessities of the industry forcibly to their attention, just in the same way the Federated Engineering Societies plan to push the prominence of the engineer in government, and to "sell" the engineering idea to Congress.

Many similar essential lobbying organizations are multiplying and strengthening their positions in Washington. The farmers' organization is acquiring suitable quarters, the labor organizations have long been established with ample equipment, and the railroad workers have their elaborate establishment. Formerly, the lobbyist was the representative of some special corporation or group of corporations who sneaked down to Washington and tried to bribe a legislator into doing the right or the wrong thing, according to circumstances. This crude beginning has been organized, made open and above board, and resolved itself into an unofficial, but none the less powerful, representative of our industrial groups at Washington, surrounding and complementing our constitutional government, and, together with it, making up, as a result of this process of evolution, a new or modified form of government, which combines the idea of industrial group representation with the democratic ideal of government representation according to population, which rests on the theory that basically a man is a man before he is anything else.

What Is Interesting Mine Managers

RECENTLY we had an opportunity of listening to the manager of a large company operating a low-grade copper deposit, on the things that were of most interest to him. "I am interested," he said, as he shifted and made orderly a pile of papers on his desk, "first in human relationships, in labor and how to handle it under existing circumstances. I am also vitally interested in finding more ore." Speaking further, he called our attention to the importance of the ore supply in relation to continuing the enterprise in which he was interested.

"Do you know what this enterprise means to our workers?" he asked. "It is their living. They have established their homes with us. The continuance of our enterprise is vital to them. Fortunately for them, we have opened up new ore horizons, and I can see a good future ahead."

There are few mine managers who have not had labor troubles and who have not had to put their best thought to the solution of the intricate questions that labor organizations have raised. The maintenance of ore supply is essential to the mining industry, for without it there would be no labor or other problems. Probably no other question is so important. Scientific prospecting and persistent effort are necessary to the end that the possibilities of a given area be thoroughly exhausted. No one realizes this better than the experienced manager, and it is a common-sense directorate that will apportion a goodly share of the net proceeds toward prospecting and developing the more promising parts of its property. As the manager has said, labor has a real interest in the enterprise, and active co-operation is essentially in its own interest.

The Play Factor in Mining Efficiency

AS AN ELEMENT contributing to his success, the technical man who has cultivated latent abilities as a raconteur and entertainer has an advantage over one who is unable to be anything more than a listener. A good story will go far in making the listeners remember not only a man's name but his personality. We are of the opinion that young engineers are likely to underrate this ability. It is, however, a distinct asset.

We know one young graduate who was immediately scooped up by a mining company because he was a good baseball pitcher. His particular work was to pitch pebbles into a tube mill. Not an especially elevating task for a technical graduate, but, nevertheless, a "starting job." As a more spectacular part, he pitched ball for the company's baseball team, and succeeded in winning from the rival teams of other companies. Baseball and other athletic teams have a considerable value in affording entertainment of a kind that the workers in a lonesome mining camp appreciate.

Mark Twain said, "It's the contrast that makes the joy of living." Some foil is thus necessary, to the never-ending work that a mining camp engenders. The further away from the city, the more important does this entertainment factor become. Life must be made worth living. We do not advocate the inclusion of a new course on the art of entertaining for mining schools, but we may properly emphasize the importance of this factor to the young man entering the mining industry. American companies operating in foreign countries often make particular inquiry in respect to the candidate's "mixing" and entertaining abilities, and selection is not solely on the basis of technical ability.

The Wave of Crime

THE usual era of crime which follows great wars has long been in evidence. Even the accumulated legends of the Wild West sink into piffling insignificance beside what actually goes on daily in our great centers of population. Can you remember the time when the robbing of a country bank or the hold-up of a train made Jesse James or the Younger brothers national figures, celebrated in song and dime novels? It seems strange to look back on such pikers, and to think they distinguished themselves for what is now the customary thing. In New York since Jan. 1, 1920, there have been more than 325 hold-ups, robberies, and thefts, working a property loss of more than three and a half million dollars; and the unsolved murders alone total more than 100.

Not the least symptom of the drifting of moral anchors is the announced program of a strong organization of clergymen to revive and enforce the ancient state blue laws and to strengthen them by Federal enforcement of a strict or "blue" sabbath. All levity and

amusements will result in fines and imprisonment; exercise will be prohibited; Sunday school will be made compulsory for children, and presumably church for adults. Dr. Burrell, one of the officers of the Lord's Day Alliance, and president of the Anti-Saloon League of New York, in announcing the campaign for these acts of oppression, also includes late rising on Sundays in his list of misdemeanors. "Our nights were given for sleep," he says, and adds that to lie abed Sunday mornings is "simply to rob the Lord of a portion of his time in which He has reserved a proprietary right."

What wave of planetary evil has brought forth this outbreak of madness in an ignorant and violent section of the priesthood, in the endeavor to strike at the foundation of the liberty and progress of their country? Like the Bolsheviki in Russia, it is improbable that their followers number over a few per cent of the population, yet the lesson of the Bolsheviki shows that a fanatic handful may impose their tyrannical will over a vast unprepared population.

Gold Coins at a Premium?

THE New York *Times* of Dec. 21, in commenting on the Government's policy in preventing the issue of gold pieces by banks for Christmas presents, says:

"What is being done is the exercise of reason and persuasion when people ask for gold pieces, but the little tokens are not absolutely unprocurable. In some cases, it is reported, banks have allowed clients to have the coins, but have charged a premium for each one. This, however, is not a general practice."

We have no knowledge whether or not the reported charging of a premium on gold is correct; but it is quite in line with the policy of the Government and the banks in restraining gold from circulation, and so putting on it a premium, whether or not that has been translated by some of the banks in an unwary moment into an actual quotation. The method of the bankers' exercise of "reason and persuasion" when people ask for a five-dollar gold coin reminds one of the nursery ditty:

"There was an old man, and he had an old cow,
And he had no fodder to give her;
So he took up his fiddle and played her this tune:
'Consider, good cow, consider—
This is no time for grass to grow;
Consider, good cow, consider.'"

And yet the bankers say we have too much gold already.

Paternalism at Rio Tinto

CONDITIONS at Rio Tinto, Spain, that led to the strike of last July, were described recently in the *Sun*. Apparently the question of wages was not the real cause of the labor dispute that shut down this famous camp. Rather, it was because the preponderant influence of the Rio Tinto Co. over the civil conditions of the community "resulted in a supervision over the private lives of the workers that they found particularly galling," if we may believe the news dispatch from Madrid referred to. "With the strike came inquiries as to the conditions at the mines that were revealing," says the *Sun*. "The miners lived in rows of gardenless houses, for which they paid a rent that, if capitalized, would purchase the house annually. Family events such as births, deaths and weddings had to be notified to the company, and a dweller on the company's domain had to get permission before he could invite even a relative to his house."

In view of the progress that has been made in welfare or industrial relationship work, one hesitates to believe that a great company would permit such conditions to exist, particularly one employing such highly sensitive people as Spaniards are. The don has always had a reputation for being haughty, and perhaps those at Rio Tinto actually prefer starvation to paternalism, as the *Sun* put it. If the latter's report be correct, the Rio Tinto management has something to learn about handling men. However, it will probably be found that the company's side of the matter has not been fairly presented. It is difficult to determine from the report given whether the trouble had its origin in welfare work improperly conducted or in no welfare work at all.

Competition for Labor

THERE exists in California a seasonal demand for labor from the farms and horticultural areas. In the mining, petroleum, and manufacturing industry the large proportion of workers are steadily employed. The competition for labor by the industries artifically stimulated by war conditions produced great interference with the unstimulated industries. A mounting scale of wages drew workers where the demand for their services was greatest, at the expense of other industries which were not readily able to meet the new conditions. A mine with reserves of rich ores could have maintained its status by meeting the increased scale, but as many mining properties in California are essentially low-grade mines, it was impossible for most to make the necessary adjustments.

The seasonable demand for labor also raised wages. There was thus established a high level of prevailing wage scales which operated with particular hardship upon all industries where margins were small and readjustment was difficult. One large oil-producing and refining company, we are reliably informed, increased its wage scale 10 per cent over the wage scales of its competitors, with the result that it was full handed while its competitors were under the necessity of conforming to the higher scale established. Not only did this work a hardship to oil companies, but it had its influence upon other neighboring industries.

We believe in high wages but we also believe that it is unwise for one mine in a given region or one industry to increase its wage to the extent of forcing a readjustment along similar lines in other industries whether related or not. There has been a steady decrease in the number of workers in the mining industry in California. High costs and competitive demand for ordinary labor have contributed to draw the workers into other industries. It will not be easy to re-establish mine-labor crews when commodity prices have reached a low enough level to enable the mines which have suspended to resume.

Just at present unemployment is beginning to appear. In some parts of the United States, it has become especially noticeable. The immediate effect of this will be to make it easier to obtain workmen. Normally there will be a necessary interval before efficient and dependable working crews have been established. This condition applies more especially to gold and copper mines and less so to the dredging industry. In spite, however, of the gloomy retrospect and the immediate difficulties of the present, the upward turn is believed to have been reached.

WHAT OTHERS THINK

Further Notes on the Gold Deposits of the Southern Appalachians

INASMUCH as I have spent the greater portion of the last six years in the southern Appalachians, H. A. Megraw's recent article on the gold situation of that region was of particular interest. His article seems to have touched the keynote of the conditions, and, in this short space, I can but second his conclusions as to the present status of gold mining there.

The gold deposits of that section of the United States fall under several different heads, but only what is popularly known as the Dahlonega gold belt will be discussed here. This belt has been traced from Alabama to Virginia and strikes North 40-50 East. It lies in the foothills southeast of the main backbone of the Blue Ridge Mountains, as the Appalachians are called in this section, varies in width from a few thousand feet to seven miles, and, in general, parallels the main folding of the range. It attains its maximum width at Dahlonega, Lumpkin County, Ga., at which place the greatest mining activity has occurred.

Fissuring took place along this belt during the uplift of the mountains. The belt itself is generally confined between two pronounced formations of hornblende gneiss, the outcroppings of which are pronounced. Between these lie the gold-bearing fissure-veins and mineralized zones which, in the main, parallel each other and the hornblende gneiss walls. These veins appear to have in general a steep dip, though the absence of deep mining operations precludes this being considered an established fact.

The occurrence of gold may be divided into four classes: Placers; free-milling quartz veins generally free from sulphides; non-free-milling veins; and mineralized zones in schist.

The placers are fluvial and most of the bottom land has been rich in these. They have been worked extensively, especially where water could be obtained easily. Dredging, I believe, has been tried only twice. In one case operation was suspended owing to the claim that gold could not be recovered because of the extreme softness of the bedrock, and from what can be learned the other operation met failure owing to the inexperience of the men conducting the work. One of the most self-evident objections to the use of a boat is the small acreage obtainable for a set-up. Most of the small placers, the secondary drainage areas and benches, are very streaky. The obvious way is to work these as the old-timers handled them, by ground sluicing. However, unless water is on the property or can be brought for other reasons than working the placers alone, the smaller placers are not of sufficient value to be exploited.

Outcroppings are not numerous, owing to the soft condition of the bedrock. Prospecting is generally done by surface panning until the lead is cornered, after which a series of open cuts is made to uncover it. The country rock has weathered in place to a depth of from fifty to two hundred feet, forming a sticky clay, and to this clay the loss of gold in milling and sluicing can be attributed, though the native blames it to flour gold. The gold is fine, 990 or better, and many handsome specimens are to be found. In White County, Ga., at the Loud mine, handsome crystallized gold nuggets are found.

In the main, the free-milling quartz veins are small, pockety, and shooty. They are free from sulphides generally, except galena. The galena occurs scattering and in small streaks, and is used as an indicator in tracing gold streaks and pockets. These veins are numerous, and in a space of one hundred feet across the belt I have counted eighteen of such leads. The stranger in the district will note the absence of intelligent prospecting, and should always bear in mind that, no matter how good a vein looks where uncovered, this is a country of pocket leads, and only a thorough test for persistency in richness and strike means anything here. Surface slipping is common, and the idea prevalent among the natives is that the deposits are shallow. This conclusion may be attributed to the fact that most of the natives are untrained, and when they have gone down on a vein it has pinched, owing to this faulting.

The sulphide veins are generally wider than the free-milling and of more even gold tenor. They carry considerable arsenopyrite. This type of ore has been a stumbling block, flouring quicksilver and sliming gold.

The last type of vein (the mineralized zone in schist) apparently is like that in the La Luz and Los Angeles mine, in Nicaragua, described in a recent copy of the *Engineering and Mining Journal.* These belt leads generally appear as a different colored "slate" in the formation. The walls are usually parallel and defined by a change in color, and may be a few inches apart or twenty feet. Within this belt is a confused mass of stringers running in all directions. These appear on the face as black etchings or at times may be small quartz veins. They generally show the presence of microscopic sand. These small stringers in some instances widen out and form pockets of coarse gold. I have sampled breasts of this type of lode that panned gold every inch across an eighteen-foot face.

As before mentioned, the softness of the country rock lends itself to hydraulic mining. Water is abundant and the rainfall sufficient to keep the local streams well supplied. The damming and ditching of streams is not expensive and water can be brought on to the property easily. One property now under development obtained ten second-feet of water under a general working head of 175 ft. by going only slightly over three miles.

The practice is to clear the surface of the ground along the outcrop, start an open cut, and follow the vein by an open pit. The hanging wall is washed away, leaving the vein lying on the foot wall, from which it is broken down, at intervals, and its entire content washed to settling boxes at the mill. The mill is generally operated by water power, and when it cannot obtain the ore by gravity, a hydraulic lift is installed to elevate water and ore from cut to mill. The general practice has been to use light, 450-lb. stamps.

Boston, Mass. JAMES FRAME.

Regarding New Caledonian Nickel

We notice the letter of the United States Nickel Co. in *Engineering and Mining Journal* of Aug. 14, commenting on some notes reprinted from our columns. So far as the firm of Ballande & Son is concerned, we had no intention of denying that M. Ballande was an "existant person"; it would be foolish on our part to do so, as the firm is well known in Australia. It is, however, the general belief, both in New Caledonia and Australia, that this firm is allied in some way with a Roman Catholic order of priests. This may be difficult to prove, but, on the other hand, the original statement was not disputed. In any case, we cannot see that it makes very much difference one way or the other.

There is one inaccuracy, a comparatively slight one, in the original statement; viz., that the nickel company "has recently taken over the electric furnaces installed by the Haut Furneaux Co. at Noumea." We understand that the nickel company, or some of its subsidiaries, took over the hydro-electric installation of the Haut Furneaux Co. The nickel company, we understand, is proceeding with its proposals for the installation of electric furnaces to produce ferronickel. The Haut Furneaux (or Ballande's) furnaces at Noumea are of the blast-furnace type. With that correction the original statements are to the best of our knowledge in order.

EDITOR,
Chemical Engineering and Mining Review.

Throttling the Prospector

In an interesting article by H. A. Megraw entitled "Gold Mining in the Southern States," which was published in *Engineering and Mining Journal* of Nov. 13, 1920, after describing the resources of the southern Appalachians in that metal, and the decadent condition of the gold-mining industry there, the writer, endeavoring to account for the latter, mentions three factors which, in his opinion, have opposed the successful carrying out of extensive operations in recent years. The first of these he states is "the law," as to which he remarks:

"The mining code [doubtless meaning the Federal Mining Law] does not exist in the South, where the landowner is also master of whatever is within or beneath it. This discourages prospecting. No one will search for mineral deposits, because, even if he finds them, he has no commercial interest in his discovery except what may be granted through the generosity of the landowner. Prospectors are not prone to depend upon that feeling. The work is of a kind that entails hardships and privations, so that the one who does it is entitled to a proportionately great reward when success crowns his efforts. Such an expectation is entirely without basis in the South, and consequently there is no systematic search for minerals."

If this is a correct estimate of the relation which the prospector bears to the metal-mining industry in its earlier stages, would it not be to the advantage of all concerned if the subject was given careful consideration by the fraternity (operators and engineers), with a view of working out some plan by which greater recognition was given to the rôle of the discoverer of mines, so as to increase the numbers and the activity of that class of men whose temperament inclines them to the exploration of new or unstudied areas of the earth's surface?

Of course the Federal law cannot now be made to apply in the East and South. But that it still does apply in the West, and has made that part of our country the most intensively operated mining field in the world, is worth remembering. But, as our governmental machinery increases in complexity with our increase in population and wealth, and bureaucratic tendencies multiply, it will be well to keep a jealous watch on the latter and defer as long as possible the coming of the condition—inevitable in the end—when all of the public domain will be as completely barred to the prospector as are now the privately owned lands of the East, the South, and the Mississippi Valley.

Vast areas of this domain have already been withdrawn from this line of activity. And though the several acts of Congress which have confirmed these withdrawals have in most instances—and perhaps all—reserved the rights of this class, in passing over their custody to the departments the latter have been authorized to establish rules and regulations governing their usage. Some of these practically annul the rights reserved in the acts, and others have made the path of the explorer so thorny with restrictions and rulings that he is abandoning the field. This is not a healthy condition of affairs.

H. D.

The Barometer in the San Juan Region, Colorado

"Stale News About the Weather" in your issue of Dec. 11, 1920, puts a slight on the ordinary barometer which a resident of the San Juan Mountains of Colorado should answer. Your remarks apply to barometers in general, but not to ours in particular. A great many houses and places of business in Ouray are equipped with barometers, either mercurial or aneroid, and these are consulted religiously throughout the winter's duration.

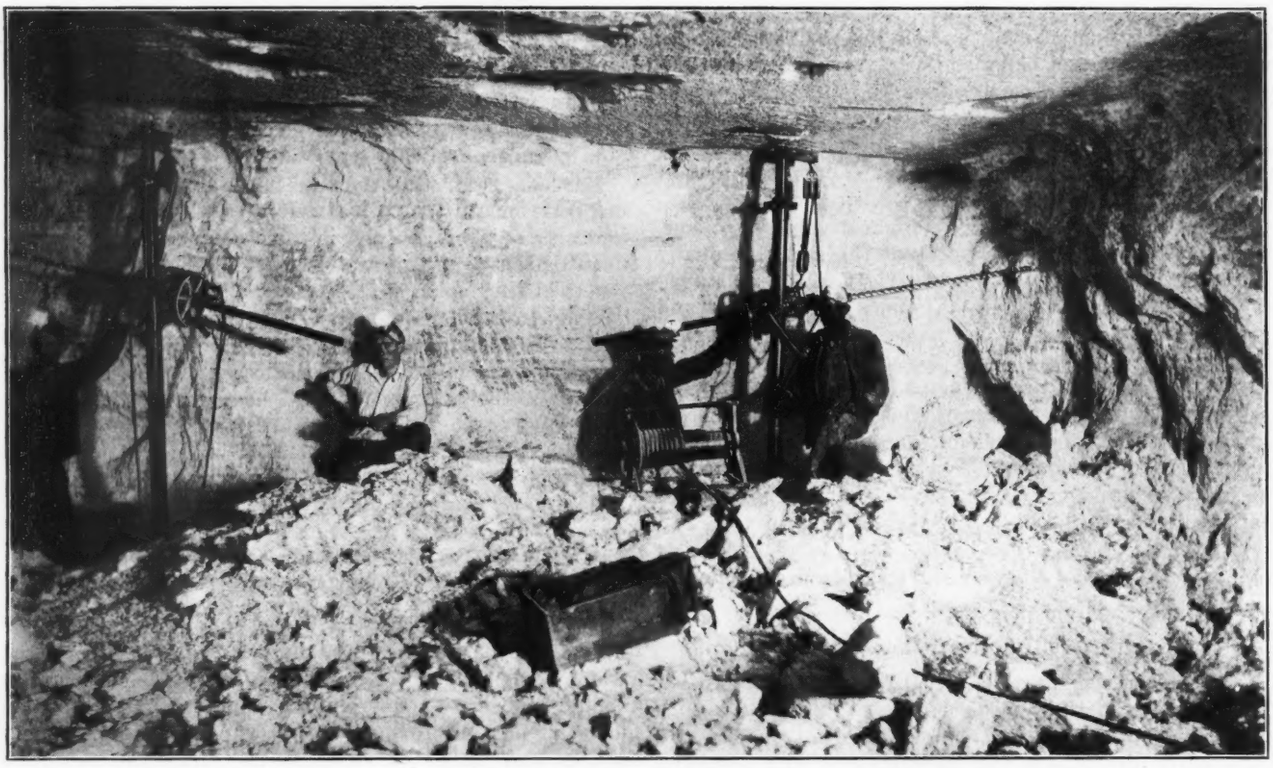
In summer these barometers are all that you say, and are not to be depended on for aid and guidance; but when the season arrives for the severe and long-continued snowstorms which so hamper mining, the barometer is a reliable prognosticator. Close watch during clear weather will be rewarded with warning of an impending storm. I have seen the barometer begin to fall during a perfectly clear, fine day, fully twenty-four hours before the beginning of a heavy three-or-four-day snowstorm which ties up all traffic. Another great service performed by our weather indicator is the prediction of the end of a big storm. Regardless of the breaking up of clouds and apparent clearing of the weather, a long-drawn-out storm is not over until the barometer begins a steady and consistent rise; and on the other hand, such a rise, even though a storm is still in progress, almost unfailingly means a complete cessation in a short time.

This might not seem of much practical use to the outsider, but the insider, the fellow who has to operate a property at timber line here, heeds the warning and hastens to get the packtrain up with grub today, instead of tomorrow. The efficiency of the local barometer is perhaps due largely to the fact that a great many heavy snowstorms are local to the San Juan Mountains, which are a compact group of high and rugged mountains rising from a comparatively level area that surrounds them.

C. R. WILFLEY.

Ouray, Col.

Salt Mining in Kansas



WORKING FACE OF STOPE AT SALT MINE OF THE AMERICAN SALT & COAL CO., LYONS, KAN.
Drills shown are electrically operated. The rooms are from 30 to 40 ft. wide and 14 ft. high. No timbering is used.

LANDING STATION AT BOTTOM OF SHAFT (994 FT. LEVEL)

Surface Energies in Flotation

An Elementary Explanation of Some of the More Important Physical Principles Underlying The Phenomena, Designed To Assist Mill Operators in Directing Experimental Work to the Best Advantage

BY FREDERICK G. MOSES
Written for *Engineering and Mining Journal*

SINCE the discovery of flotation and its practical application, surface tension, surface energies, and their related phenomena have been considered to possess a possibly important bearing on both the theory and practice of the art. Unfortunately, however, practical flotation men have been forced to give most of their attention to the development of commercial operations and the technique of their business, to the neglect of the more theoretical and interesting phases of the process. This attitude on the part of practical flotation operators and engineers has been a retarding factor to all phases of flotation advancement. Any trustworthy and promising theory as to the art should be founded on data which can be obtained only in commercial plants. The men who can logically furnish this sort of data are those who are in actual control of these operations. For these reasons, it is most important that a greater interest should be developed in the more theoretical side of flotation than the average busy operator or engineer has given it in the past. It is hoped that the theoretical consideration here presented will assist toward the promotion of these ends.

PRINCIPLES OF FLOTATION

Investigation of any theory of flotation implies a knowledge of physical chemistry and molecular physics. However, it is neither necessary nor desirable for flotation engineers to delve deeply enough into these subjects to become expert physical chemists, in order to take advantage of these sciences in their daily work. A superficial consideration of some of the principles of these subjects as applied in flotation is bound to give a clearer conception of practical operations to the operator, and should aid him in obtaining a more comprehensive view of his every-day problems. An understanding of some of these physical and molecular theories may also suggest new lines of investigation.

Few, if any, of the theories that are presented here are claimed to be original, and the data offered are not the result of personal experiment. The conclusions are those that have appeared from time to time in sometimes obscure places that have not been readily available to the busy engineer.

Many of the observed facts of flotation seem to indicate that some of the phenomena of the process are caused by, or closely related to, surface energies. It will be the primary object of this discussion to direct attention to some of these surface energy phenomena and to suggest their possible application.

Surface tension is the basis for all surface energy considerations. Simply defined, it is that condition of stress under which the surface of all liquids is known to be and in which all solids are assumed to be. It is generally known that the free surface of any liquid acts as if it were confined under a thin, well stretched elastic membrane. The presence of this stressed surface is demonstrated by the formation of round droplets of a liquid when it is suspended in another liquid of the same specific gravity in which it is not soluble. The manner in which a needle can be supported on the surface of water is well known. This is made possible by the supporting power of the surface film or surface tension of water.

The Laplace theory,[1] which has been advanced to explain the presence of this tension and which has been generally accepted, assumes that the molecules of a liquid attract each other with a comparatively strong force, which, however, acts over a very short distance. A proof that this force does exist is the fact that polished metal surfaces such as copper can be made to adhere quite strongly to each other. The fact that these surfaces will not adhere when the surfaces have become tarnished has been advanced to prove that these forces act over a very short distance.

Assuming, then, that the molecules of a liquid do attract each other, and that this attraction is effective over only a very short distance, it will be readily seen that those molecules of the liquid, with the exception of those in the surface layer, are under the same stress or pull in all directions, and are, therefore, in a condition of equilibrium. Those molecules in the surface layer of the liquid, however, have no attraction from above to balance that from below. They are, therefore, less free to move in all directions. This resultant phenomena is what is known as surface tension.

It is evident that this stress or strain is a form of energy. For water, it is a comparatively large force, being equal to 75 dynes per centimeter at 0 deg. C. The force necessary to produce one square centimeter of surface tension under the conditions mentioned above is, therefore, equal to 75 ergs. Undoubtedly, this is the energy that is largely responsible for most flotation phenomena.

SURFACE TENSION OF SOLIDS

The surface tension of solids is a subject that is a little difficult to visualize. The presence of the surface tension of solids has never been proved experimentally and can be conceived only by analogy or by mathematical considerations.

It is a demonstrated fact that the surface tensions of liquids increase as the temperature decreases. As the point of solidification is reached it is unreasonable to suppose that they suddenly become zero. The whole science of physics is based on the continuity of phenomena. It is more reasonable and logical for the physicist to believe that at the solidification point of the liquid the surface tension remains and in fact increases. The fact is that mathematical demonstrations have shown that solids do have surface tension and that the value of this energy is very high, when compared to certain liquids, such as water, for instance. Also, many

[1] "Surface Tension and Surface Energy," Willows, R. S., and Hatschek, 2d. ed., p. 8.

substances, such as wax and asphalt, although hard enough to give out a resonant sound when struck, will sag and otherwise act as a liquid of very high viscosity. These substances are also known to have surface tension when liquid.

Surface tension of solids is of interest because it is apparently connected with the phenomena of flotation, as will be shown later.

Surface Energy

Surface tension, strictly speaking, is a unit of measurement of the energy in the surface of a liquid or a solid. It would follow that the total energy in the surface of a liquid or a solid is the product of the surface tension and area of surface exposed.

It has been suggested that surface tension is directly due to an unbalanced intermolecular attraction, and it follows that the amount of energy in the surface of the substance will be a function of the strength of the attraction between the molecules. The attraction between the like molecules of a certain substance is usually different in amount from the attraction between the like molecules of a different liquid. This is one of the reasons for the different boiling points of unlike liquids. It will, also, indicate the reason for different liquids having different surface-tension values.

This fact leads to an important phase of surface energy, that is, interfacial tensions. It has already been suggested several times, but cannot be emphasized too often, that the surfaces of liquids and solids are the seats of energy. When two liquids that are mutually insoluble are in contact, or when a liquid is in contact with a solid that is insoluble in the liquid, it will be evident that the two seats of surface energy are in contact. How will these two tensions react on each other?

The explanation of the construction of matter involves the conception of small particles of matter called molecules, surrounded on all sides by a space. This space is called the intermolecular space. Although the molecules in the surface of a liquid or a solid have been shown to be under a stress, there is no reason for believing that the intermolecular spaces do not still exist.

Now, when two mutually insoluble liquids or a liquid and an insoluble substance are in contact, it is logical to believe that the molecules of one of the substances may penetrate into the intermolecular spaces in the surface of the other material. In other words, the surface tensions of the two materials may be considered to have so intermingled as to give but one seat of surface energy. This single seat of surface energy at the contact between two liquids or a liquid and a solid is called interfacial tension.

The next point that may be raised is, "What will be the amount of energy in the interfacial tension and on what will it depend?"

It would be expected that the energy at the interface would depend on whether the molecules of the two substances attract or repel each other and on the extent of the attraction or repulsion. If there is a mutual attraction between the molecules of each substance, the amount of the unbalanced stress in the surface of the substances should be reduced in a degree corresponding to the amount of attraction. This should result in the interfacial tension containing a correspondingly low amount of energy as compared to that in the surface of either of the two materials under consideration. If, on the other hand, the molecules of the two substances repel each other, the energy in the interface of the two substances should be increased by an amount corresponding to the decreased attraction available to balance the molecules in the two surfaces. In this way, the energy in the interface will be greater than that in either of the two surfaces when considered alone.

The property of surface energy which is probably responsible for a large number of flotation phenomena is the tendency of surface energy always to reach that condition of equilibrium at which it is a minimum.

Surface tension is a stretch, and as such is always tending to make the area of the liquid a minimum. This is demonstrated by the formation of droplets of a liquid whenever possible. This reduction in surface area is one of the means by which the surface energy of a given system may be reduced, for, as has already been shown, surface tension is one of the factors in surface energy. It is not possible for this always to take place, however, especially when the surface is already a minimum, as it usually is, or when the surface involved is that of a solid. Under such conditions, if the surface energy is reduced, it must be accomplished by some other means than by a reduction in surface area. Adsorption, which will be discussed later, is the other most common way of obtaining this result.

The important point to be emphasized, however, is that this continual struggle of surface-energy equilibriums to lessen the quantity of surface energy is, undoubtedly, the cause of many of the phenomena which the flotation man takes advantage of in his every-day operations.

Reinders' Surface Energy Equilibriums

Several years ago, before flotation had become a practical process for concentrating sulphide ores, Reinders[2] made some investigations to determine the action of fine solid material in the presence of two immiscible liquids. The facts brought out by this work are significant when applied to modern froth flotation, and can be made the basis from which some interesting and striking conclusions can be drawn. The application of these surface-energy equilibriums to flotation was suggested by Ralston[3] and enlarged upon by Perkins and Corliss.[4]

Assuming that two immiscible liquids are present, and a finely divided solid which is insoluble in either of the liquids:

Let $T_{1,s}$ = the interfacial tension between liquid 1 and the solid.

Let $T_{2,s}$ = the interfacial tension between the liquid 2 and the solid; and

Let $T_{1,2}$ = the interfacial tension between the two liquids.

Then Reinders found that when

$T_{2,s} > T_{1,s} + T_{1,2}$ the solid will remain unchanged;

$T_{1,s} > T_{2,s} + T_{1,2}$ the solid will go entirely into liquid 2.

$T_{1,2} > T_{2,s} + T_{1,s}$ the solid will collect at the liquid-liquid interface and, if possible, separate the two liquids from each other.

"If, however, no one of the interfacial tensions are greater than the sum of the other two, then the disperse phase, (or solid,) will collect at the liquid-liquid interface, but the three phases will be at a certain contact angle."

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[2] *Kolloid Z.*, Vol. 13 (1913), p. 235; also Hoffman, *Z. Phys. Chem.*, Vol. 83 (1913), p. 384.

[3] Ralston, *Min. & Sci. Press*, Oct. 23, 1915.

[4] Corliss, H. P., and Perkins, C. L., *Jour. Ind. & Eng. Chem.*, Vol. 9, No. 5, May, 1917, p. 481.

The applications of these equilibriums to flotation can be readily seen, because, for a sulphide to float, it must either collect at the interface between the water in the pulp and the insoluble oil that is used, or it must collect entirely in this oil.

At this point it will be necessary to bring out clearly the action of one of the constituents of the oil that is used. It must be understood that a bubble is exactly like the surface of water which is in contact with air. A bubble is simply the surface tension of water surrounding a quantity of air. Therefore, when conditions are such as to give a contact between the oil that is used and the free surface of water, conditions must also be correct for the oil to form an interface with a bubble in the same manner as it forms an interface with, or coats, the free surface of the water. A clear understanding of this is necessary to all flotation considerations.

One of the first observations made when working with the theory of flotation was that the sulphide minerals are less easily wetted by water than are the associated, vitreous gangue minerals. It is necessary that there be a natural relation between the minerals in the ore, or it must be brought about artificially.

This relative attraction of the water for the sulphides or gangue minerals is a resultant of the surface energies of the minerals themselves, both sulphide or vitreous; the water or liquid in which they are suspended; and the air or other gas in contact with the water. In other words, the wetting of the gangue minerals and the non-wetting of the sulphides is the resultant of a set of conditions that may be changed or controlled within limits, rather than an inherent property of the minerals themselves. That these conclusions are true may be shown as follows:

Let $T_{w,a}$ = the surface tension of water or the interfacial tension between water and air.

Let $T_{s,a}$ = the interfacial tension between the solid and air.

Let $T_{s,w}$ = the interfacial tension between the solid and water. Then, when $T_{w,a} > T_{s,a} + T_{s,w}$ the water will not wet the solid. It should be noted that *solid* and *not sulphide* is mentioned. When the gangue mineral fulfills these conditions it will not be wetted, and in a flotation machine it would be found to float.

When no one of the interfacial tensions is greater than the sum of the other two, the water, air, and solid will meet at a definite contact angle. This actually means, when a sulphide which does not normally tend to be wetted is considered, that this sulphide does have some slight tendency to be wetted but that the air has an even greater affinity for the surface of the mineral, in this case a sulphide particle, than has the water.

Flotation Without Oil

When nature has been kind enough to give the conditions which have just been found to be necessary in order that the sulphide will not be wetted while the gangue is, and to a great enough degree, flotation can be accomplished without oil. Under these conditions the sulphide will go into the air-water interface and be supported there while the gangue will be wetted and sink, owing to its weight. Because of the inherent weakness of the air-water interface, the great problem with this sort of flotation is that of getting the sulphide in contact with this interface and supporting it there. To overcome this difficulty the so-called "skin machines" known as the Macquisten tube and the Woods were developed. In these machines the mineral was carefully placed on the surface of the water or, more scientifically speaking, in the air-water interface. The practical limitations of this type of apparatus are well known.

Oils in Flotation

Oil has three functions in the usual flotation practice: (1) to assist in bringing about, in those cases where they do not naturally occur, the correct surface energy balances between the air, water, and solids, necessary to cause the gangue to be wetted and for the sulphides to remain dry; (2) either to strengthen the air-water interface or substitute a more satisfactory one, such as an oil-water interface; (3) to lower the surface tension of the water so that bubbles can be made, or, stated differently, to multiply the area of the interface which will be available to support the mineral.

When oil is considered as a factor in surface energy balances, several involved complications are encountered. However, if only the interfacial tension balance is considered, the matter may be greatly simplified.

To take the simplest case

Let $T_{s,w}$ = the interfacial tension between solid (sulphide) and water.

Let $T_{s,o}$ = the interfacial tension between solid (sulphide) and oil.

Let $T_{w,o}$ = the interfacial tension between water and oil.

When $T_{s,w} > T_{s,o} + T_{w,o}$ it is found that the solid (sulphide) will go entirely into the oil layer in contact with the air-water interfaces which may be distributed through the water. Of course, this oil may be a coating on a bubble, which is, as has been pointed out, the same as being in contact with the free surface of water.

If none of the interfacial tensions are greater than the sum of the other two, the sulphides will go entirely into the water-oil interface; or even better, at the contact between the oil and water which is the condition most generally found and the one that is always desired.

These equations were formulated for a finely divided insoluble material, and nothing is said regarding difficultly wetted sulphides. This is an important and striking fact. It is usually assumed that only sulphides which are not wetted by water can be made to go into the froth in flotation. This is not the fact: rather, any substance can be made to go into the froth provided it sets up the correct surface energy balance with the water and oil that is being used. Every practical flotation operator has, at some time, found all of the mineral in the froth, either in the form of sulphide or gangue. This is probably the explanation.

Of course, this is not saying that the sulphide surface is not necessary for practical flotation; in fact it is of paramount importance. Flotation is a method of making a separation, and this is done by causing one class of minerals to go into the froth and the other to remain in the body of the liquid, the classification being based on the character of the surfaces. The separation is obtained by setting up a surface balance such as will cause the mineral with one type of surface, usually the sulphide, to go into the froth. The sulphide is not a requisite for getting a mineral in the froth but simply for getting it in a different part of the machine than the waste material which has a surface of another type. This fact has been illustrated by the experiment of attempting to separate a sulphide mineral from fluorite by flotation. The fluorite was found in the froth and the sulphide in the tailings.

If the mineral is carried in the oil-water interface, the bubbles must be coated with a thin film of oil in order to have this oil-water interface on the bubble. These facts are evident by inspection of all flotation machines. The oil is usually spoken of as a coating on the bubbles, which are simply the surface tension of water surrounding a certain amount of air. Hence, if the surface energy equilibrium necessary to cause oil to spread in a thin layer on water can be discovered, the conditions necessary for oil to coat the bubbles made from the same water will be obtained. Of course, the term oil here refers to the insoluble constituents of the oils that may be used.

The surface-energy balances that must hold to have the oil spread on water have been determined, and it follows that the same balances must obtain to have the oil coat the bubbles. This balance is as follows:

Let $T_{w,a}$ = the interfacial tension between the water and the air.

Let $T_{o,w}$ = the interfacial tension between the oil and water.

Let $T_{a,o}$ = the interfacial tension between the air and oil.

Then, when $T_{w,a} > T_{o,w} + T_{o,a}$ the oil will spread on the water in a thin layer or on the bubbles that are formed from this water.

From this it is evident that the kind of oil to use to coat the bubbles will depend on the air-water interface or on the surface tension of the water, which in turn is a function of its purity. Impure water may therefore interfere with or assist in obtaining good flotation results and also, certain chemicals may be added to advantage.

Sizing of Minerals and Surface Energies

An attempt has been made to show the relation between surface energies and flotation results. It is evident that the total surface energy of a liquid or a solid is the product of the surface tension per unit by the number of units. On this basis, it would be expected that the size of the particles of the ore being treated by flotation would have a bearing on the results obtained, and this is true to a certain extent.

In practical operation, both the valuable and the waste minerals are found in both the tailings and the concentrates. On examination, however, it is found that the sizes of the two types of minerals are quite different in the tailings and concentrates. In the froth, for instance, will be found the sulphide from a certain maximum size to all of the smaller sizes. The maximum size of the gangue present will be much less. Cases are known, however, where the gangue will average larger in size than the valuable mineral in the concentrates.

If the surface energies are dominating factors in separation by flotation, it is reasonable to suppose that the total surface energy of certain sizes more nearly fulfills the conditions demanded by certain froths than other sizes, both as to the valuable and the gangue minerals, and hence sizing is an important factor in flotation.

The oils which have been mentioned are those which are added as a means of furnishing a *locus* in which the minerals to be floated can be collected. For this reason, these oils are known as "collectors" or "collecting oils." Nothing has been said of the so-called "frothing oils."

Stated in the most general sense, any soluble material which will lower the surface tension of the water, or the water-air interface, will cause the formation of a froth in the presence of aëration, or agitation which is, of course, simply a means of aëration. Not all substances which are soluble in water and reduce its surface tension are satisfactory forthing agents in flotation, however. The reason for this can be demonstrated.

Every surface-tension equilibrium which has been shown to be necessary for successful flotation has been an inequality. In the one which is responsible for the spreading of the oils on the bubbles, the air-water interface or surface tension makes up the left-hand side of the inequality, and if this inequality be destroyed, so also will the result. Therefore, it would follow that a successful frothing oil in flotation would be one that will reduce the surface tension of water, or the left-hand side of the inequality, and at the same time, to keep the same ratio of inequality, the frothing material must reduce the right-hand side of the inequality in the same or a greater ratio. Very few materials have the property of accomplishing this; hence, the few materials which act as satisfactory frothing agents.

Adsorption

A theoretical consideration of flotation could be discussed from so many ramifications and angles that, in a paper of this sort, it is possible to consider only a few of the most important. Adsorption is one of these. Adsorption is a change in the surface energy of a liquid caused by dissolving in it some material which will change the surface energy of the solvent liquid and cause an excess or deficiency of the dissolved material in the surface of the liquid, compared to the concentration in the bulk of the solution. There are two kinds of adsorption—positive and negative.

When a dissolved substance reduces the surface tension of a liquid, causing an excess of the dissolved substance in the surface of the solution over the concentration of the dissolved substance in the body of the solution, the phenomenon is called positive adsorption; when the opposite is the case, negative adsorption.

To understand the cause and meaning of positive and negative adsorption two general facts must be kept clearly in mind. The first is that all soluble substances will either increase or reduce the unit surface tension of the solvent liquid. The other, that the total surface energy of a liquid solution always tends to become a minimum.

Assume a vessel of a liquid, say pure water; the liquid will have a certain definite surface tension, and the surface energy of the system or liquid will reach equilibrium at a certain minimum value. This will be true, because it will be assumed, for simplicity, that the surface area is also a minimum. It is also true that after a soluble material which increases or reduces the surface tension is dissolved in the water the increase or reduction will be greater the more of the soluble material dissolved. Now, imagine that a certain amount of substance is dissolved which causes a certain theoretical reduction in the surface tension of the solution and which will give a certain concentration of solution. This material dissolved in water will give a system wtih a lower surface tension and, also, one the surface energy of which will at once attempt to become a minimum value. As surface energy is a product of area and surface tension the surface energy of the system could be further reduced, either by a change in the area of the surface or a further reduction in the other factor. surface tension. In the present case, how-

ever, the area was assumed already to be a minimum. Therefore, to reduce the surface energy further, the surface tension must again be lowered. This can be caused only by an increase in the quantity of the surface-tension reducing material in the surface of the solution. This is what actually happens. More of the dissolved material is found in the surface of the solution than in the bulk of the solution under the surface, a fact which can be demonstrated by experiment. This phenomenon of reducing the surface energy of a solution by an increase in the amount of the dissolved substance in the surface of the liquid over that in the rest of the liquid is positive adsorption.

When the dissolved salt has the property of increasing the surface tension, it is necessary for the surface energy to be reduced by a reduction in the quantity of the dissolved salt in the surface of the liquid or a lesser concentration of the dissolved substance in this surface than exists in the body of the liquid. This is negative adsorption.

The principal effect of adsorption in flotation is due to the manner in which the dissolved salts and their adsorption effects can vary surface energies and surface energy equilibriums. As any material which is soluble will either increase or reduce the surface tension of the solution or, in this case, the mill water, therefore, from a theoretical standpoint, any material which is soluble in water is a flotation reagent and may either be harmful or beneficial. This is one of the reasons why it is necessary to use water from the future mill supply when making preliminary laboratory flotation tests.

Under certain conditions a chemical may be of benefit to flotation and under other conditions a detriment. Adsorption may explain this. If a certain set of surface energy equilibriums is necessary for good flotation, and a reagent is introduced which, by adsorption, will upset the conditions necessary for flotation, it is evident that this reagent would be a detriment. If, on the other hand, the correct surface energy balance for good flotation does not exist, and some soluble reagent is added which will cause a closer approach to the necessary condition, that reagent, possibly the same one as in the previous case, would be a benefit.

The large number of these factors to be considered, and the involved way in which they all work together, make difficult any attempt to work out a strictly scientific theory that could have a practical application. A sensible way to attack the problem would be, if possible, to determine the surface energy involved with certain minerals and gangues, which, at least, should give possibly a rough classification of ores from the standpoint of their flotation amenabilities. It would also be feasible to work out surface-energy values for different oils and oil-water interfaces. These things can be done only by men who have had thorough and special training, but these men must also depend largely on the flotation engineers and operators for much of their data.

Mining Activities in Saltillo, Mexico

In the Saltillo mining region, Mexico, is the Providencia mine, belonging to the Compañia Minerales y Metales, producing 4,000 tons of lead-silver ore per month, which is shipped to the company's smelter at Mapimi, in Durango. This mine employs 300 men. La Perlita, belonging to the Compañia Metalurgica Mexicana, produces a small quantity of lead-silver ore, which is handled by the company's smelter at San Luis Potosi. The Cabecillas, belonging to Guillermo Purcell y Compañia, produces a small quantity of rich lead-silver ore, also shipped to San Luis Potosi. At Higueras, northeast of Saltillo, the Compañia Minerales y Metales has another mine. This company's head office is in Monterrey and it has a branch office at Saltillo.

Movements of Metals and Minerals During October

Imports and exports of the more important metals and ores, as reported by the Department of Commerce for October, 1919, and the figures for October, 1920, as finally revised, are as follows:

IMPORTS, OCTOBER, 1919, AND OCTOBER, 1920
(In Pounds, Unless Otherwise Stated)

	Oct., 1919	Oct., 1920
Antimony ore, contents	14,054	32,452
Antimony matte, regulus or meta'	2,420,025	1,621,529
Copper:		
Ore, contents	4,004,003	2,628,987
Concentrates contents	3,208,468	6,560,428
Matte regulus, etc., content	3,256,640	437,087
Imported from (in part):		
Canada	3,051,262	1,455,614
Mexico	6,493,722	2,740,003
Cuba	221,760	2,522,934
Chile	30,223	1,632,738
Peru	166,865	1,387
Unrefined, black, blister, etc	17,392,398	13,944,279
Refined, in bars, plates, etc	.....	9,530,951
Old, etc., for remanufacture	182,001	99,293
Composition metal, copper chief value	224,109	985,240
Lead:		
Ore, contents	3,036,568	961,092
Bullion, contents	8,285,550	2,488,556
Imported from (in part):		
Canada	885,614	579,630
Mexico	8,706,834	2,870,018
Chile	1,684,052	.....
Pigs, bars and old	1,721,764	20,652,897
Manganese ore, long tons	15,863	44,700
Imported from (in part):		
Cuba, long tons	32	14
Brazil, long tons	8,620	26,100
British India, long tons	2,300	7,988
Tungsten ore, long tons	592	24
Pyrites, long tons	67,155	16,908
Imported from:		
Spain, long tons	42,707	11,308
Canada, long tons	19,548	5,600
Tin ore, long tons	2,366	1,466
Tin bars, blocks, pigs, etc	16,210,512	6,741,331
Imported from (in part):		
United Kingdom	3,226,310	1,623,788
Straits Settlements	11,611,756	3,545,977
Dutch East Indies	742,104	280,233
Australia	510,760	235,200
Zinc:		
Ore, contents	2,998,115	1,571,458
Imported from:		
Canada	220,993	2,194
Mexico	2,777,122	1,504,458
Blocks or pigs, and old	469	.....

EXPORTS OF COPPER, LEAD AND ZINC
(In Pounds)

Copper:	Oct., 1919	Oct., 1920
Ore, contents	3,000	.....
Concentrates, contents	46,457	.....
Refined, in ingots, bars, etc	44,001,239	19,270,781
Exported to (in part):		
France	18,637,926	5,531,926
Germany	.....	3,263,094
United Kingdom	11,233,988	4,423,793
Canada	2,689,079	1,084,171
Japan	9,128,000	.....
Netherlands	.....	1,063,357
Composition metal, copper chief value	5,297	3,891
Old and scrap	2,355	64,928
Pipes and tubes	785,585	671,346
Plates and sheets	698,132	686,418
Wire, except insulated	4,112,327	2,604,500
Lead:		
Pigs, bars, etc :		
Produced from domestic ore	237,274	354,139
Produced from foreign ore	8,098,662	448,178
Exported to (in part):		
France	1,120,000	224,07[illegible]
United Kingdom	448,000	.....
Canada	158,530	54,002
Argentina	1,120,000	.....
Brazil	604,075	233,662
China	560,143	94,843
Zinc:		
Dross	42,100	147,820
Spelter:		
Produced from domestic ore	21,426,860	1,423,067
Produced from foreign ore	190,950	830,000
Exported to (in part):		
France	2,364,510	424,2 3
United Kingdom	10,615,759	1,082,518
Canada	605,534	.....
Mexico	.....	214,331
Japan	5,934,472	.....
In sheets, strips, etc	2,756,837	1,235,753

Engineering in Japan

Facilities for Technical Education Not Equal to the Demand—Absence of Practical Training A Weak Point, Resulting in Poor Supervision of Manual Workers

BY CHARLES F. MASON
Written for *Engineering and Mining Journal*

APPARENTLY the facilities for education in the engineering professions in Japan are very complete, although it is to be regretted that the schools are not large enough, or numerous enough, to accommodate all of the aspirants for educational honors. It is human nature to want what we can't get, and therefore not very surprising to find that a higher education is regarded here with almost holy reverence.

All Japanese children are required to attend the primary school, which insists on no examination, of course, and has a six-year course. Graduating from the primary school, the future engineer takes a competitive examination for the middle school. If he fails in this examination, as nine-tenths of the pupils do, of necessity, there being only room enough in the middle school for about one-tenth of the primary-school graduates, his future schooling is limited to two years in the higher primary school, which he may enter without examination. I am told that scholarship is frequently not the only consideration required in passing.

JAPANESE HIGHER EDUCATION

Having conformed with all the requirements, our pupil finds himself in the middle school, where he studies for five years, during which time he makes his acquaintance with the English language. At the end of that time he takes another competitive examination, either for a technical institute or, if he intends to enter the university, for the high school. The regular technical institute course is three years, but the medical and commercial courses require an extra year. The high school course is also three years, and it, too, can accommodate only about a tenth of the number of middle-school graduates. Upon graduating from the high school our student again competes with his classmates for the privilege of entering the university, but his chances are better this time—about one in three. His engineering course in the university takes three years, whereas law or medical courses require an extra year.

During his university course our hero (I think I may safely call him that by now) is supposed to get practical experience in the field of his future endeavors, by working in shop or mill, mine or smelter, during his summer holidays, in addition to his research work in the university shops and laboratories. But this is seldom done, and to this fact, I believe, may be traced the lack of efficiency that exists in so many of the engineering enterprises in this country. In America it is realized that no man can be really qualified to give orders unless he is capable of executing the same orders himself in a satisfactory manner. Here it is just the opposite, apparently. This statement is largely the result of my own observation, but it has the confirmation of one of the best-known engineering authorities in Japan, who is now professor of mechanical engineering in Tokyo University.

About two weeks ago one of the large copper-producing companies here decided to reduce its operating force, in view of the business and financial depression which has existed here for several months. Accordingly, the management discharged about sixty office employees. Great indignation was expressed on all sides, and the sixty discharged employees got together to do something about it. What they did was to send to the directors of the company a petition stating that they felt that a great injustice had been done; that laborers, when discharged, could find other employment, whereas they (the petitioners), being college men and therefore unable to perform manual labor, could not. The rest of the office employees are now considering a strike, as a method of securing the reinstatement of the discharged ones!

The Japanese mechanic, as I have found him, is a good workman, and as a rule his shortcomings may be directly traced to a woeful lack of supervision. If he is inclined to be a little stubborn in the matter of being allowed to do a job his own way it is probably because experience has taught him that he usually knows more about the job than the man giving the instructions. If he is inclined to slight details it is simply because usually no one checks him up. As for responsibility—well, I have yet to see a native mechanic who is responsible for anything.

MISTAKES OCCASION LAUGHTER

The following came to my personal notice: At one of the Japanese government arsenals a number of 45-deg. cast-iron elbows were needed for a 12-in. pipe line. A drawing was made by the engineering department and a blueprint sent to the engineer in charge of the foundry department. In about fifteen days notice was received that the elbows were ready, but they proved to be 135-deg. ells instead of 45. Loud and prolonged laughter. Everybody concerned was sent for, from the engineer in charge of the foundry department down to the moulder's helper. Louder and more prolonged laughter. The engineer in charge explained: Yes, he had received the blueprint and the order. He had explained carefully to the moulder what was wanted. The moulder must have misunderstood him. A rare joke. More laughter. After two or three cups of tea all round, the matter was disposed of to the satisfaction of all present by laying the blame at the door of the foreign engineer who was in such a hurry to get the pipe-line finished. A small incident, perhaps, but one may be pardoned for wondering how many of the quarter-billion dollars asked for next year's naval appropriation will go toward furnishing bases for similar jokes.

I could quote a lot more incidents involving more serious consequences than the above, but none that would illustrate more clearly the attitude of the average Japanese college-bred engineer toward his vocation. It is, after all, typically Japanese—I think Bill Shakespeare must have had Japan in mind when he wrote that line about the wish being father to the thought.

Gold Mining in California

BY C. H. FRY
Written for *Engineering and Mining Journal*

IN 1914, California produced approximately 1,000,000 oz. of fine gold. The estimated production for 1920 is 700,000 oz., a decrease of 300,000 oz. The principal reasons for this decrease are increased costs of operation, shortage of labor, inefficiency of labor, lack of electric power, and depletion of gold deposits. Were 1914 conditions existing at present, California's gold output for the year would be greater than it was in 1919, for mines which have been opened since 1913 are producing more gold than was produced in 1914 by the mines now abandoned.

Of the larger gold mines operating in 1914, five have either entirely ceased operations or are doing little work. With perhaps one exception, these mines could still operate at a profit under 1914 conditions. Many mines had large blocks of ore in reserve in 1914, and, as costs have steadily increased, these blocks of ore have become "rock in place," and have been excluded in calculating ore reserves. Two of the larger mines have been removed from the list of producers by mine fires and subsequent flooding. Despite increasing costs, there are at present two large producers that were not being operated to any extent, if at all, in 1914, and had not been operated for many years prior. These mines have ore of a grade that allows them to be operated at a profit even under existing difficulties.

The number of men employed in the gold-mining industry in the state was 4,200 in 1914, the production being 1,000,000 oz. In 1920 there were 2,600, the estimated production being 700,000 oz. This would indicate that more gold per man employed had been produced in 1920 than in 1914. This is true, not because the men were more efficient, for they were not. The explanation is that it became necessary to work higher-grade ore and gravel to meet the increased costs.

From the reports of Charles G. Yale, of the U. S. Geological Survey, three dredges were operating in 1898, the combined output being $18,887. In 1910 the number of dredges had increased to seventy-two and the output to $7,550,254. These figures refer to gold only and do not include the platinum recovered. The number of dredges gradually decreased. In 1913, the combined output of sixty-three dredges was $8,090,294. In 1914, sixty dredges were operating, and the production was $7,783,394. At present thirty-one dredges are operating, and the estimated output for 1920 is $7,000,000, or approximately one-half of the entire gold production of the state. The various types of dipper and suction dredges built in the earlier years of the dredging industry have been discarded for the close-connected bucket-line type, with bucket capacity ranging from seven to twenty cubic feet. It is interesting to note that the price of an 18 cu.ft. manganese-steel bucket which cost $490 in 1916 was $1,080 in 1920. In one instance, the cost of operations per cubic yard handled during the years 1914-17 was 4.57c. In 1919 it was 6.41c.

The larger dredges, costing from one-half to three-quarters of a million dollars, handle enormous amounts of gravel, but the initial investment is so large that the gravel deposit must be correspondingly extensive and of a value that will allow a profit and the entire amortization of the dredge. Consequently, small or low-grade deposits are not worked.

The Mother Lode section of California is today, in my opinion, one of the most promising gold districts in the United States. When costs of operations were low, large bodies of low-grade ore were profitably worked. This cannot be done now, and it has become necessary to find higher-grade ore, to mine and mill by more economical methods, or to shut down. One or more of these expedients have been adopted by the various mining companies operating in the district.

One of the oldest and best-known mining companies in the state decided that it had been "mining too cheaply." In other words, it was handling a large tonnage of low-grade ore in an attempt to keep down costs by "quantity mining." A system of mining was adopted by which a smaller tonnage of high-grade ore was mined and milled and the lower-grade ore once sent to the mill is now left in place, or, if broken down, it is sorted from the better ore and left in the mine. The plan has proved to be a success.

The experience of a number of mines proves that the Mother Lode orebodies persist to a considerable depth. Large bodies of high-grade ore, better than $10 per ton, have been found between 3,000 and 4,000 ft. below the surface. Geological conditions give no indication of reduction in grade with a reasonable extension in depth. As the depth of mining increases, the cost increases, more power and a longer time are necessary for handling men, supplies, and ore, and ventilation problems become more complicated. Timbering is a large item in costs. Most of the ground is of such a nature that heavy timbers are required, and, in addition, filling must be kept close to the "backs." The timbering must also be done by experienced men, and the number of these men available is inadequate.

There has been only a slight decrease in the cost of supplies. The large proportion of labor cost represented in the purchase of supplies signifies that wages and the cost of supplies must come down together.

It is highly improbable that the large low-grade orebodies and low-grade gravel deposits now known to exist will in this generation become as profitable as have been the large low-grade bodies of copper ore which could not be worked profitably a few years ago.

The opening of a new gold mine or the reopening of an old gold mine under present conditions demands careful investigation. After all considerations have been given due weight, a large factor of safety must be used to allow for the uncertainties of state and Federal taxation, cost of labor, supplies, electric power, and workmen's compensation.

Gold mining is a legitimate, hard, business proposition, but there is always much of the speculative side to it. Particularly is this so in the prospecting and development stages. This, together with the sentiment connected with many old gold mines, has to a large extent been responsible for the maintenance of the interest in gold mining during the last five years, and will be a not unimportant factor in the future.

Economic Minerals of Madagascar

A Résumé of the Studies of Professor Lacroix, of Paris, and Professor Duparc, Of Geneva, on the Commercially Important Mineral Products of the Colony, Including Graphite, Corundum, and the Ores Rich in Radium and Thorium

BY GEORGE F. KUNZ
Written for *Engineering and Mining Journal*

PROF. ALFRED LACROIX, of the Muséum National d'Histoire Naturelle, of France, and an investigator of the mineral deposits of Madagascar during the last twenty-five years, recently presented, in an address at the Muséum[1], some of the most important facts respecting them. In a previous presentation of the resources of Madagascar at the Muséum Professor Lacroix had described the deposits of gold and precious stones occurring on that island, and, in the address first referred to, he discussed other and perhaps even more valuable minerals. Among these, he especially places the graphite and corundum deposits and the ores rich in radium and thorium, and draws attention to the fact that, as the importance of many of the last-named ores has been recognized only in recent years, information about them is not always readily attainable, and is to be found only in the works of those investigators who aimed to present a thorough mineralogy of the region then studied, without respect to the apparent commercial value of the substances.

To a great extent the minerals named occur in the so-called "red-earth" of Madagascar, which covers a large part of the surface of the island, and originated from the decomposition of siliceous rocks. As a result of this decomposition, the silicates have lost their alkalies, lime and magnesia, and progressively a considerable part of their silica. The "red earth" (a lateritic clay) is readily broken up, when damp, by the spade. When dry, it becomes hard, but yields to the stroke of a hammer. It constitutes a surface crust which sheds rain water and is not turned into mud by it. The depth of the crust is often considerable, sometimes as much as sixty feet or more. In spite of its resistance, the rainfalls exercise a notable chemical effect, and, owing to consecutive dissolution, the lighter and less coherent particles are washed away, slowly but surely, leaving on the summits and flanks of the mountains and hills, or in the valleys into which they have rolled, the heavy and non-oxidizable minerals, such as quartz, the precious metals, iron ore, corundum, and other minerals. The "red earths" Prof. Lacroix designates as "eluvions," to signify the alteration in place, as distinguished from the alluvial action which bears away the fragments to deposit them elsewhere.

The deposits of graphite in Madagascar occur principally in crystalline schists. In contradistinction to the conditions that obtain in the Canadian deposits, the graphite deposits of Madagascar which have an economic value form part of the gneisses and mica schists. The graphite content varies widely and its distribution is irregular. An important peculiarity of these deposits, from a practical point of view, is that the rocks containing the graphite are always superficially altered. All the essential minerals except the graphite and the quartz are transformed into a lateritic clay, and hence the material can be exploited under the most favorable conditions. The zone of alteration is generally so thick that it can be worked for a long time, but when the solid rock is reached, the exploitation will become more costly and perhaps no longer profitable.

Geographically, the graphite deposits are widespread. At present, exploitation is principally localized in the regions easy of access. On the high plateaus, ores containing as low as 8 per cent of graphite have been exploited, and on the west coast the minimum may fall as low as 5 per cent. The rapid growth of the work is shown by the increase in the number of prospected deposits from two in 1908 to 3,775 in 1918. Methods employed in extraction have been improved from time to time. The price is determined, after a chemical analysis, by the carbon content. When the carbon is from 80 to 90 per cent of the whole, the material is worth from 10 to 15fr. per kilogram.

The graphite of Madagascar is of excellent quality, rivaling that of Ceylon in the markets of England and the United States. It has no admixture of sulphides or calcium carbonate, and is therefore well adapted for crucibles. During the war the island furnished not only France, but the Allies also, with graphite for this use. The purest kinds of graphite, 97 or 98 per cent carbon, are taken by the electrical industries, certain lots having brought in 1917 as high a price as 2,000 fr. per ton. Graphite exports from Madagascar from 1907 to 1919 inclusive are given in Table I.

TABLE I. GRAPHITE EXPORTS FROM MADAGASCAR

Year	Metric Tons	Year	Metric Tons
1907	8	1914	11,232
1908	82	1915	15,940
1909	197	1916	26,254
1910	545	1917	35,000
1911	1,247	1918	16,000
1912	5,348	1919	4,983
1913	7,997		

In the beginning of 1920, the stock of graphite on hand was 32,000 tons. Prices rose from 400fr. per ton in 1914 to as high as 1,200fr. in 1917 (in Marseilles). At present, the quotation in Marseilles is 850fr. per ton for 80 per cent carbon content.

Another mineral product of Madagascar that has been mined and exported is corundum. In its gem form, ruby or sapphire, not much has been found on the island, but the opaque or commercial corundum occurs in the disintegrated sedimentary deposits that have been described. The character of the corundum differs from that found at Craigmont, Canada, which shows no traces of mica, whereas that from Madagascar frequently exhibits mica incrustations. The exports of this mineral from Madagascar for 1910 to 1919 inclusive are given in Table II.

TABLE II. EXPORTS OF CORUNDUM FROM MADAGASCAR

Year	Metric Tons	Year	Metric Tons
1910	11	1915	327
1911	150	1916	914
1912	496	1917	739
1913	1,098	1918	178
1914	555	1919	812

[1] "Les Industries Minérales non Metallifères à Madagascar," address delivered at the Muséum National d'Histoire Naturelle, May 2, 1920, Paris.

The small quantity exported in 1918 was due to transportation difficulties which influenced the trade of the colony for two years or more. With a little effort, it is estimated that an annual production of several thousand tons could be made. Sapphire crystals, too dark in hue to be useful as gems, occur in the sands of the Ankaratra. As they are very pure and homogenous, they can be employed in watch-making. Commercial corundum of the first quality sells for 800fr. per metric ton in Marseilles, the second quality being quoted at 750fr. Scotland and Italy are the principal importers, some corundum also being taken by Germany. Professor Lacroix remarks that although but little is used in France directly, the product is salable enough there at a higher price after it has been crushed abroad and re-imported.

Of even greater interest are the various uraniferous minerals found in the island, and also the varieties of titanite. In the mica schists of western Ambatofinandrahana (north of Matsiatra) there are interesting deposits of rutile, of which several tons, in the form of large crystals, have been extracted. During the war, this mineral was used for the manufacture of titanium chloride, which has the property of forming very dense vapors. Respecting the uranium minerals, now so much sought because of their radium content, Professor Lacroix notes that, although a deposit of autunite occurs at Vinaninkarena, south-southeast of Antsirabé, the chief radioactive minerals of the island belong to the group of titano-niobo-tantalates, among which are fergusonite, samarskite, and euxenite. The two former are rare on the island, but the latter is more frequently found. Peculiar to Madagascar are betafite, from the neighborhood of the town of Betafo; samiresite from Samiresoy, and blomstrandite and ampangabeite from Ampangabé. All these minerals are associated with potassium pegmatites containing muscovite and black tourmaline in addition to other minerals. The radioactivity of these minerals, taking the oxide U_3O_8 as unity, is given as follows: Betafite, 0.96 to 0.64; blomstrandite, 0.64; samiresite, 0.50; ampangabeite, 0.61 to 0.32; euxenite, 0.50 to 0.32; fergusonite, 0.48 to 0.27; samarskite, 0.24.

Pegmatites Containing Radioactive Minerals Are Decomposed

These minerals can be easily exploited because of the decomposed nature of the pegmatites containing them and the abundance of the "eluvial" deposits. Most frequently they are byproducts in the exploitation of beryl. Radioactive minerals are found in Madagascar almost wherever there are pegmatites with beryl, but the deposits furnishing nearly the total of the present production are situated between Lake Itasy and Antsirabé. The richest deposit of betafite is that of Ambatofotsy. About twenty metric tons have been extracted from this deposit.

The difficulty experienced in putting these Madagascan minerals on the market is due, in the first place, to the necessity for a new and a more complex chemical treatment than that required by autunite and carnotite, and secondly to the presence in the minerals of a small amount of thorium. Although the disintegration of thorium furnishes the radioactive mesothorium, the duration of its activity is inferior to that of radium, and therefore the radium salts containing mesothorium lose their grade of radioactivity in time, and are therefore of less commercial value. The exports of the radioactive minerals from Madagascar for the years 1912 to 1917 inclusive are given in the reports of the Service of Mines, and Table III is taken from this service.

TABLE III. EXPORTS OF RADIOACTIVE MINERALS FROM MADAGASCAR

Year	Kg.	Year	Kg.
1912	11	1915	1,209
1913	5,000	1916	1,221
1914	8,801	1917	7,280

The ore is sometimes sold according to its radium content, the unit being the milligram per ton and being estimated as worth from 100 to 200fr. Some of the betafites have commanded as high a price as 15,000fr. per metric ton. The use of the thorium minerals in the making of incandescent mantles renders the deposits of these minerals in Madagascar an additional source of wealth. The great monazite deposits of Brazil, which have been worked for the last twenty-five years, are well known. In Madagascar the beryl-pegmatites contain an abundance of large crystals of monazite. However, if the island is destined to become a centre of monazite production, the mineral will be won chiefly from the river sands.

Notable Deposits of Zircon

Another group of commercial importance are the zirconium ores. For a long time the sole source of zirconium was the silicate or zircon, but in 1893 there was simultaneously discovered in Ceylon and Brazil, small monoclinic crystals of pure zirconium, which were described under the names baddeleyite and brazilite. Pure zirconium is not known in Madagascar, but, recently, deposits of zircon have been found which on account of the abundant product they furnish cannot be compared with any other in the world. They appear to be susceptible of industrial utilization. In a deposit to the west of Solila immense crystals of zircon have been discovered, weighing up to several kilograms, and measuring 15 cm. in greatest dimension. The mineral has also been found over a region of 15,000 hectares to the north and south of Mananantanana, between Mananborona and the Ingaro, and especially on Mount Ampanobé. The perfection of the forms indicates that this is an eluvial deposit. Besides its use for crucibles, in the proportion of 90 per cent zirconium and 10 per cent magnesium, this substance is used in the construction of electric furnaces.

An extensive study of the minerals of Madagascar by Professor Lacroix is soon to be issued under the auspices of the colonial government. This work will contain everything that is known concerning the matter, and the material will be arranged in the masterly way characteristic of Lacroix's publications.

Regarding the gem minerals of Madagascar, much valuable information has been given by Prof. Louis Duparc, of Geneva.[2] The pink beryl of Maharitra, Madagascar (which has been called "morganite"), is distinguished from all the others by its high degree of refraction. The aquamarines of Ambatolampy and Tetehina, as well as the pink beryl of Tsilaisina, have a notably lower degree of refraction, and the aquamarines of Antaboko and of Tongafena form, in respect to the indices of refraction, an intermediate group between the beryl of Maharitra and the aquamarines of a pale blue color. The pink beryls of the pegmatite veins of Tsilaisina occur in fragments so large as to indicate

[2] "Les minéraux des pagmatites des environs d'Antsirabé à Madagascar," Genève, 1910.

their being parts of crystals of great size. They are of a peach-bloom pink. Sometimes the crystals are of a pale salmon color, and this latter shade is regarded by Professor Duparc as a beginning of alteration. The specific gravity averages 2.7165.

The deposits at Tsilaisina also furnish a great variety of tourmalines. Most of those seen by Dupare were either of a pale yellow color, or of a pronounced greenish brown. Others displayed a very light asparagus green, or were even colorless. The great majority of the crystals were zoned. In these the succession of the different hues varied greatly. Sometimes the center was dark brown, and the very narrow outer border pink. Between the nucleus and this border were a series of tints ranging from brown to greenish yellow. A contrasting arrangement, occurring even in the same pegmatite vein, showed a violet-pink nucleus with a narrow bordering of a greenish yellow, or a deep-hued brown. Some small crystals showed the asymmetrical coloration noted by Lacroix in certain types from Maharitra; for example one of Duparc's specimens was green at the pole terminated by the rhombohedron and pink at the opposite extremity, with an almost colorless zone between.[3]

A spessartite garnet is a constant accessory mineral, not only in the pegmatites of Tsilaisina but also in other deposits. The larger crystals are generally opaque or translucent, but small transparent crystals often occur. At Tsilaisina many fragments of fairly large size have been taken from the kaolin, offering transparent areas susceptible of being cut, and furnishing pretty gem stones up to one and a half carats in weight.[4]

[3]Louis Duparc, *op. cit.*, pp. 389, 390.

[4]*Idem*, pp. 403, 404.

Safety Bulletins in South America

Mine operators in South America have not been slow to recognize the value of accident prevention, and already several of the larger companies have instituted complete safety departments, which are conducted in a similar manner to those now organized in the United States. The accompanying illustrations show two of the safety or "security" bulletins which have been prepared by the safety department of the Chile Exploration Co. The warnings and instructions are printed in Spanish so that they may be understood by the greater number of the employees. The bulletin on the left applies particularly to open-pit operations, the translation being as follows: "The danger of failed shots—Keep away from the dead shot for a half hour or—you can expect this." The warning on the right, which applies to the handling of explosives, is as follows: "Do not meet explosives with a lamp. Do not forget that other lives may be sacrificed, although you may not be interested in yours."

CHILE EXPLORATION CO.
BOLETIN DE SEGURIDAD
EL PELIGRO DE LOS TIROS "ECHADOS"
NO REGRESE AL SITIO DONDE SE HA QUEDADO UN TIRO, HASTA QUE POR LO MENOS HAYA PASADO UNA MEDIA HORA; DE LO CONTRARIO.....
EL RESULTADO PUEDE SER ESTE.
CHILE EXPLORATION CO.
BOLETIN DE SEGURIDAD
NO DESHIELE EXPLOSIVOS CON UNA LAMPARA
NO OLVIDE QUE OTRAS VIDAS SE PUEDEN SACRIFICAR AUNQUE A UD. NO LE IMPORTE LA SUYA

SAFETY BULLETINS USED BY THE CHILE EXPLORATION CO

Government Officials Prominent in Mining

B. L. Johnson

BY PAUL WOOTON

B. L. JOHNSON has been designated as the head of the division of foreign mineral resources of the U. S. Geological Survey. For the last two years Mr. Johnson has been intensively engaged in a study of foreign mineral deposits. For the last eight months he has been the acting head of the division. Prior to the entry of the United States into the world war, no particular effort had been made by the Geological Survey to compile data on the mineral resources of other countries. The war brought out the absolute necessity of having accurate knowledge of this character. Just before this country entered the war, work along this line was begun under the immediate direction of J. B. Umpleby. An amount of information was gathered that was unusual considering the amount of time at the disposal of Mr. Umpleby and his staff. The collection of data was regarded of sufficient importance to justify its transposition to Paris for use during the Peace Conference. Following Mr. Umpleby's resignation, the work was taken over for a short time by Eugene Stebbinger. Mr. Stebbinger was called upon to take up some important oil work, and since that time Mr. Johnson, with the aid of a number of assistants, has been adding to the rather pretentious nucleus which was obtained during the war. It is intended to allot enough money to this research to make it possible to keep the domestic mining industry well advised as to mining activities throughout the world. Work on a considerable scale is to be done at once to gather this data.

B. L. JOHNSON

In addition to the collection and analysis of information on the geology and mineral resources of foreign countries, the section undertakes to disseminate this information where it will be most helpful to American industry. One of the great advantages which the section enjoys is an arrangement with other departments of the Government through which all official figures compiled by foreign governments are made available.

Current foreign literature covering all activities of mining interest is scant, and pertinent items are filed. Nearly 20,000 such items are now available. They are filed by countries and by commodities. The section conducts a considerable correspondence with the mining interests of this country.

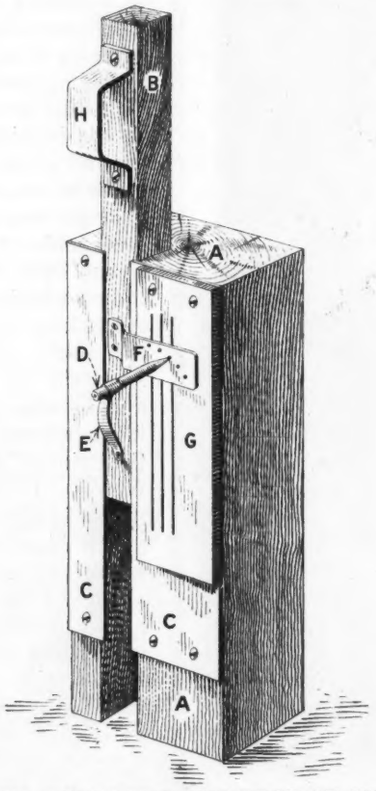
Mr. Johnson was born in Boston. His early education was obtained at the public schools of Stoneham, Mass. Later he entered the Massachusetts Institute of Technology, from which he was graduated as a mining engineer in 1905. Immediately thereafter he accepted service with the Geological Survey. His first work was in the division of underground water resources. Later he was assigned to geologic mapping in the coal fields of Wyoming. From 1909 to 1917 he did geologic work in Alaska. During Mr. Johnson's Alaskan research he discovered chalmersite ($CuFe_2S_3$) in the copper deposits of the Prince William Sound region. It occurred in massive form and in such quantities as to permit its shipment as an ore. The only other known occurrence of this mineral is in the Morro Velho mine, in Brazil. He is also credited with the recognition and subdivision of the Pleistocene terracing in the North Carolina Coastal plane. Mr. Johnson is the author of the following publications of the Geological Survey: "Pleistocene Terracing in the North Carolina Coastal Plain"; "Occurrence of Wolframite and Cassiterite in the Gold Placers of Dead Wood Creek and Birch Creek Districts of Alaska"; "Gold Deposits of the Seward-Sunrise Region, Alaska"; "The Port Wells Gold Lode District"; "Mining on Prince William Sound" (1913); "Gold and Copper Deposits of the Valdez District"; "Mining on Prince William Sound" (1914); "Retreat of Barry Glacier"; "Mining on Prince William Sound" (1915); "Occurrence of Chalmersite in Alaska"; "Mining on Prince William Sound" (1916); "Copper Deposits of the Latouche Knight Island District"; "Mining in Central and Northern Kenai Peninsula"; "Mining on Prince William Sound" (1917); "Mineral Resources of Jack Bay and Vicinity"; "Geology and Mineral Resources of Latouche and Knight Island District"; "The Port Valdez and Jack Bay Districts." In addition Mr. Johnson is the joint author of many Survey publications.

HANDY KNOWLEDGE

Device for Measuring the Stamp Drop

A handy device originated by "Blanco" Whiteside, of Mogollon, N. M., for measuring the actual drop of individual stamps, without hanging up the entire stamp battery, is shown in the illustration.

The square stick *B* slides easily in the groove of the block of wood *A*, being held in by two pieces of gal-



DEVICE FOR MEASURING THE DROP OF INDIVIDUAL STAMPS

vanized sheet *C*. A pencil *D* is held by the spring holder *E*, which is fastened by a screw to *B*. The point of the pencil may be placed in any one of the five holes in the guide *F*, which is a piece of galvanized sheet fastened by screws to *B*. When the stick *B* travels in its groove the pencil makes a straight mark on *G*, a sheet of red gasket rubber, from which marks can be easily cleaned when desired.

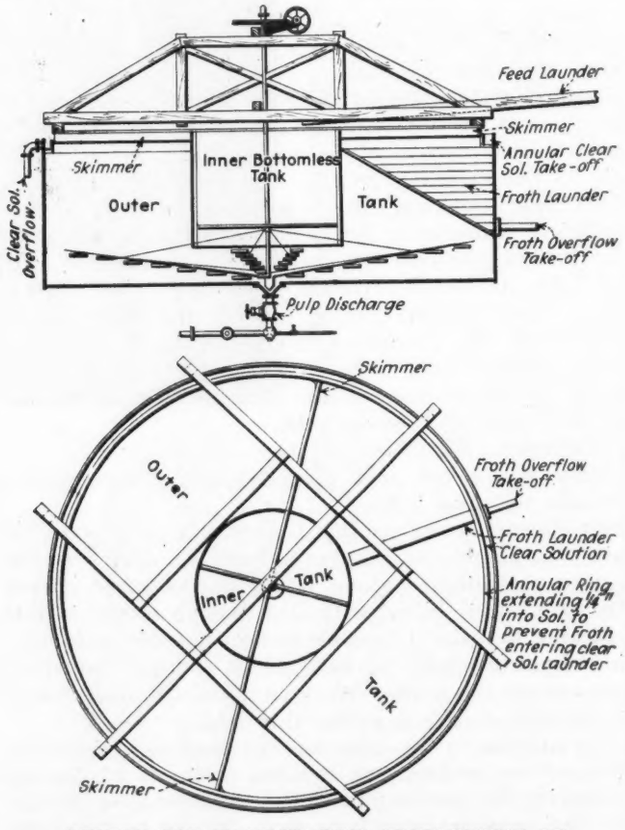
In using the device the batteryman holds the block of wood *A* with one hand on top of the moving tappet of No. 1 stamp; then, with the other hand, he brings the end of *B* up against the upper guide timber, or a horizontal timber placed at the right height for this purpose. To make the operation easier, a handle *H* may be attached to *B*. Five or six drops of the stem produces a straight line on the gasket rubber, which represents the actual height of drop of that stem under working conditions. The pencil is then shifted to the second hole in the guide *F*, the operation repeated for No. 2 stamp, and so on until the lines on the gasket rubber show graphically the drop of each stamp of the entire battery. The five lines can be measured, and the stamps hung up one at a time and tappets set in accordance with the measurements. The setting of the tappet of the feed stem is the only part of the operation which necessitates hanging up the entire battery.

Settling Flotation Concentrates

BY G. L. SCHMUTZ

Difficulty often has been experienced at concentration mills in the settling of flotation concentrates. To remedy this, a tank was designed and developed by P. A. MacEachern and L. D. MacRae, and is giving excellent results at the concentrator of the Montezuma Copper Co., at the Mina Mexico, and at the Potter & Palmer Mining Co. at Nacozari, Sonora, Mexico.

The device consists of a Dorr thickening tank, upon the vertical shaft of which is attached an inner bottomless tank, or diaphragm, and skimmer arms. These



DEVICE FOR FACILITATING SETTLEMENT OF FLOTATION CONCENTRATES

revolve with the shaft. The feed is introduced at the top of the diaphragm, and the outer tank is charged from the bottom of the diaphragm. The inner diaphragm is approximately one-third the diameter of the thickening tank and extends downward two-thirds of

the depth of the outer tank. An annular stationary ring protects the clear water overflow from froth, and the skimmers discharge into a froth launder, which is shown in the illustration. Clear water, froth, and thickened concentrates are the products made. The device has been patented (No. 1,313,714).

Circulating Mud-Laden Fluid With Cable Tool Drilling*

BY M. VAN COUVERING

The idea of circulating mud-laden fluid in oil wells drilled with cable tools, in the reverse direction from that in general use, is not a new one, but the method, embracing a number of new features, as worked out by L. R. Evans, superintendent of the Lake View No. 2 Oil Co., merits description for the benefit of operators not familiar with it.

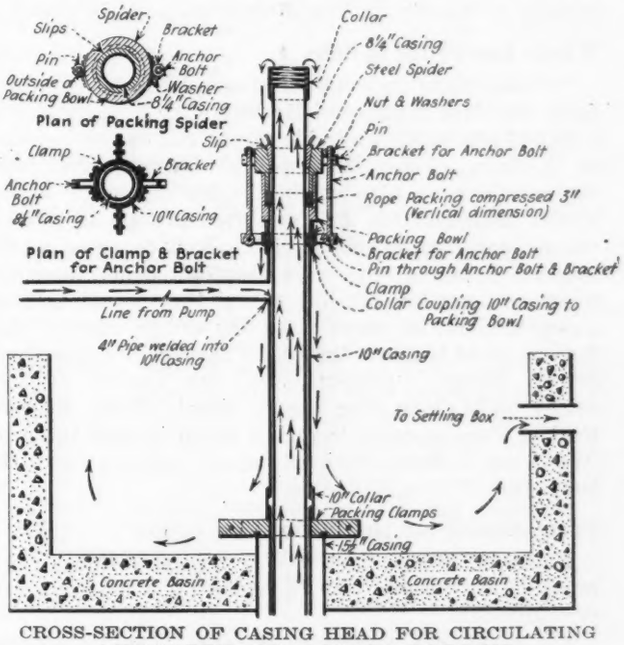
The equipment described was in use by the Lake View No. 2 Oil Co., in its well No. 25, on Section 34, T. 32 S., R. 24 E., M. B. D. and M., in the Midway field. After cementing the 10-in. casing at 2,540 ft., the 8¼ in. casing was carried to a depth of 3,190 ft., with cable tools, with continuous circulation of mud-laden fluid, and was cemented at the latter depth. In drilling from 2,540 to 3,190 ft. the 8¼-in. casing encountered loose caving shale and two strata of water sand, one of which contained flowing water, and it was, furthermore, carried past some sidetracked casing.

The principal feature of the equipment is a special packing head which permits circulation of mud-laden fluid at all times except when passing a collar of the 8¼-in. casing through the packing head. This head consists of a packing bowl containing rope packing, resting on a shoulder of the bowl, and a spider with a downward extension which compresses the packing. The 8¼-in. casing rests on slips, which, in turn, rest on the spider mentioned above. In addition, the spider is held down by a pair of anchor bolts which are attached, at their lower end, to a clamp on a 10-in. collar. This collar also serves as a coupling between the 10-in. casing and the packing bowl, which rests upon it. When it is desired to move the 8¼-in. casing, it is only necessary to remove the slips, when the packing head will be held in place by the anchor bolts.

The upper portion of the 10-in. casing consists of a short nipple, into the side of which is welded a section of 4-in. pipe. When the work has been completed the 10-in. nipple can be removed and used at other wells. The fluid is pumped into the 10-in. casing through the 4-in. pipe mentioned above. The packing head prevents its exit at the surface between the 10 and 8¼-in. casings, so it is forced downward between these casings and muds the formations exposed below the shoe of the 10-in. casing. When the shoe of the 8¼-in. casing is reached, that portion of the fluid which did not pass into the formations passes upward, inside of the 8¼-in. casing, to the surface, where it overflows and is caught in a concrete basin below the floor. The dimensions of this basin are 10 x 10 x 4 ft. deep. The walls are 10 in. and the floor is 14 in. thick. To prevent the cement from setting against the 10-in. casing when the basin was built, a joint of 15½-in. conductor pipe was placed vertically in the floor of the collar around the casing. The space between the 15½ and 10-in. casings is packed off with packing clamps. The outlet of the basin is a section of 6-in. pipe passing through the wall, about a foot below the top of the wall. From this point on the fluid is handled as in drilling with rotary tools; that is, it is discharged into a settling box leading to a tank and is then pumped back into the well.

The equipment and method described offer a number of advantages over the method in general use in mudding with cable tools. The working casing is open at all times, doing away with the casing head, including steel ring, plates, plunger, and rope clamps. Circulation can be maintained while running in, pulling out, drilling, or fishing. (Fishing for a bit was continued for five days in this well without stopping the circulation.) The only time that circulation need cease is while passing a collar through the packing head. A joint can be "circulated in" while the spider holds the pressure on the packing.

In the ordinary method of forcing the fluid upward between the casing and the walls of the hole, much of the sand and coarse material is carried with the mud,



CROSS-SECTION OF CASING HEAD FOR CIRCULATING MUD-LADEN FLUID WHILE DRILLING WITH CABLE TOOLS

a large amount either passing into the porous formations, and thereby greatly lessening the thoroughness with which the mud fluid seals these formations, or lodging on the collars and other projections between the casing and the walls of the hole, thus interfering with the circulation and, in many cases, "freezing" the pipe. In addition to this, much coarse material remains in the bottom of the hole, to be drilled out later.

In the method here described the cuttings and cavings are washed up inside the working string of casing to the surface and are deposited in the concrete basin, settling box, or tank, leaving only the clean, smooth mud to be forced into the porous formations. Furthermore, there is no coarse material to clog up the space between the casing and the walls of the hole. It has been noticeable that the pump pressure necessary to maintain circulation in this well was 50 lb. per square inch, which is much lower than is usual with circulation in the opposite direction. The hole has been open and the 8¼-in. casing perfectly free at all times.

*Excerpt from an article in August, 1920, "Summary of Operations, California Oil Fields," California State Mining Bureau.

BY THE WAY

Da Capo

The last word in the famous bauxite controversy has again been uttered—this time by a writer in the *Bauxite News*, published by the American Bauxite Co. Standing secure in the knowledge that his company mines over 90 per cent of the bauxite produced in the United States, this person boldly asserts that he should have a little to say on the subject of how the name of the mineral should be pronounced. "So settled and familiar has the pronunciation of bauxite as 'box-ite' become in this section of the country," says he, "that we have had laborers come here from a distance looking for the box factory. In conclusion, we beg to serve notice on all persons either within or without the borders of the United States that we, here, have finally and irrevocably decided that the proper pronunciation of bauxite is 'box-ite'." The discussion is again closed.

Where Ignorance Is Bliss

"No use talkin', m'son," said Cap'n Dick, "a chap these days mus' 'ave some specialization a'for 'e gaws h'after a job. If 'e 'as'nt 'e's liable for to fall daown some'ow or h'other. Take tha case o' Tommy Trembath. Tommy, 'e gaws h'up an' h'asks for a job, an' at tha h'office they asks 'im if 'e can fire. Never 'ad 'e tried un, so, dam-me, 'e gets no job. Back 'e gaws to tha boardin' boss, 'oo tells un 'e shouldn't made 'imself so h'ignorant any'ow, for like as not they would 'ave 'ad a man to show 'im raoun' for a day or two. So nex' day Tommy gaws h'up an' tha boss h'asks 'e if 'e nawed 'ow to run pumps. 'Dam-me, yes,' sez Tommy, 'I been raised right 'long side one o' they.' Then tha boss h'asked Tommy, could 'e pack a pump if need there be. 'Well,' sez Tommy, 'it h'all depen's on 'ow 'eavy tha beggar be.'"

From Maelstrom to Muleback

Philip N. Moore, of the War Minerals Relief Commission, has received the following from a Democratic correspondent:

The Republican maelstrom is over. The flotsam and jetsam sucked in will be cast out to demand performance of all the pre-election promises and many more.

Among the very reasonable demands, they will demand that the price of wheat and corn shall be higher. Bread and bacon lower. The coal baron must continue to receive handsome profits, the wages of the coal miner must be increased, the price of coal must come down.

The railroad, steamship and trolley lines must receive higher dividends, the people be carried for less. The excess profits must be taken off of big business, but the public must not pay more.

England must be pleased. Ireland satisfied. The Turk must not butcher any more Armenians, but no American warship shall enter a Turkish port except for social purposes. We must regulate the affairs of Europe, Asia and Africa, but no American mother's son must be required to fight in foreign lands.

You must satisfy the gouger and the gouged, the nigger and the Hun; the profiteer must continue to reap the golden harvest, the public to obtain things for less.

It's a big job, but you wanted it, you won the Democratic Mule—now ride him. He is warranted to buck. He will do some bad acting in a few years and you are due for a header in four years. Then we will take him back. We know how to handle the critter.

News From the Oil Fields

M. C. Trumbull, of Mansfield, La., a manufacturer of sawed and bucked tight barrel staves, headings, and hardwood lumber, is also interested, though not financially he states, in a wonderful instrument for locating oil. This is not the ordinary instrument used for the purpose but very extraordinary, indeed. It will tell approximately how big a well can be had by drilling. This marks a step forward in the design of such devices. Another improvement might be added by making it possible to tell how long it would be before salt water would come in. However, Rome was not built in a day, and Mr. Trumbull is doing very well as it is. He has worked with the instrument for over a year in Louisiana, Texas, Oklahoma, Kansas, Colorado and Wyoming without a single failure. He has seen over 200 wells brought in as the instrument has foretold. But he does not want to sell anyone even an interest in the device. Instead he wishes he had one himself. However, he will arrange to give demonstrations without cost. As reference he gives the Bank of Commerce & Trust Co. at Mansfield. Here is a chance for the enterprising one of simple mind.

The Fitchered Hole

A fitchered hole's the toughest thing I've tackled underground,
And I've gone against some rough stuff in my wanderings around;
But when it comes to meanness that will test your very soul,
There's nothing that compares to a badly fitchered hole.

Oh! there's different kinds of misery that make a miner swear,
It may be gas and powder smoke or foul and dusty air;
And carbide lamps that sputter out or choke and make a fuss
Are little incidental things that make a miner cuss.

It's bad enough to have a boss who's growling all the time,
Who kicks at this and kicks at that in going round the mine,
And the trammer has his troubles when a car goes off the track;
He swears, but gets a piece of steel and swears, but puts 'er back.

A wiggletail's a beastly thing we sometimes have to run,
And the wearing of a muzzle isn't looked upon as fun.
Oh! the eating of a sweaty lunch and drinking hard boiled tea
Has made a lot of miners say, "She's deep enough for me."

There isn't any pleasure in a hot and gassy raise,
It burns your eyes and nose and throat, your head is in a daze.
Sure there's nothing very pleasant in a wet and sloppy shaft,
And a boulder blocking up the chute will drive a mucker daft.

But these are only little things I mention by the way;
They're things a miner overcomes so he can draw his pay.
When things are going smoothly and you're getting in a round,
A fitchered hole's the meanest thing you'll tackle underground.

You'll fight and curse and sweat and work until you're all but in,
For a fitchered hole's the meanest kind of concentrated sin.
Some day you'll start for heaven, but before you reach the goal,
Saint Peter's goin' to ask you what you called a fitchered hole.

W. J. PIKE.

CONSULTATION

Literary Assistance to the Engineer's Reports

"Recently I heard from a friend that a representative of the *Engineering and Mining Journal* had stated at an editorial conference that there were certain publications of the U. S. Government which are of material assistance to engineers and others interested in the preparation of technical reports and the authors of papers on technical subjects. May I ask you to tell me in detail exactly to what publications reference was made?"

There are two Government publications which are a great help to anyone desiring to improve in technical and even in general writing. The first, the "Style Book of the Government Printing Office," is essentially a reference book on the typographic style to which Government publications are expected to conform, and goes into such matters as capitalization, abbreviation, spelling, the uses of italics, and punctuation. A pamphlet, "Extracts from the Style Book of the Government Printing Office," covers the essential features of the more voluminous compilation. The other publication to which reference was made is entitled "Suggestions to Authors of Papers Submitted for Publication by the United States Geological Survey," by George McLane Wood. Its title is suggestive of its contents, for the text clearly and excellently points out pitfalls in careless writing, and discusses the proper use of certain words, giving valuable suggestions as to expression, general relation of the items in a report, misuse of phrases, grammatical errors, and typographic style. It also describes in a practical manner the correction of proof sheets, and printers' terms and practices. The publication is by no means new, but it seems to be known to a relatively small circle. It should be of particular interest to mining engineers who have much to do with writing geologic and mine reports. The principles expounded, however, apply to any writing, and every engineer will do well to have a copy of this excellent pamphlet in his possession for guidance in his literary efforts. It can be obtained from the Superintendent of Documents, Washington, D. C., for 15c.

Tube Mills vs. Ball Mills for Fine Grinding Flotation Feed

"Please tell me why tube mills and pebble grinding are not used in flotation mills. Is it a case of greater efficiency, and therefore economy, to use steel balls for grinding, or does the grinding by pebbles produce a condition of some kind in the pulp which is unfavorable for flotation? Also, could pebbles be used in a ball mill constructed for steel ball grinding? What would be the effect of their use in such a mill?"

Tube mills and pebble grinding are generally used nowadays in this country if it is desired to grind exceedingly fine; that is, where none of the product must be coarser than, say, 100 mesh. Such extremely fine grinding is usually not necessary in flotation, most sulphide particles floating satisfactorily if ground to 48 or 65 mesh. For grinding to this size, ball mills, using steel balls, are more efficient, chiefly on account of their much greater capacity per unit. In some operations it may also be that abraded particles of steel act as an aid to flotation. This theory was first advanced, we believe, by Dr. Gahl, at the Inspiration mill. However, the chief reason for the use of ball mills with steel balls is that such use means a lower grinding cost. Still, the practice is not universal. At the Ray Consolidated mill, at Hayden, Ariz., for example, 10 x 7-ft. tube mills have been used, and possibly still are, for regrinding rougher table tailings for flotation. In these tube mills, both 2-in. manganoid balls and cubes of siliceous rock have been used.

Pebbles or mine rock can be used in a ball mill instead of steel balls, but steel balls cannot be used in a pebble mill for any length of time, for they would tear it to pieces. The effect of using pebbles instead of steel balls would be to cut the capacity markedly, and result in a difficulty in taking as large-sized particles in the feed as formerly; the power required to turn the mill would be much less, and probably a longer life of the mill lining per ton ground secured.

Flat vs. Round Pebbles in Tube Mills

"I wish to thank you for your very full and complete answer to my recent questions about tube-mill and ball-mill grinding.

"In describing the use of tube mills at the Ray Consolidated you speak of their using 'cubes of siliceous rock.' The imported Danish pebbles which I have seen were well rounded. In the case out of which these questions arose a so-called 'native pebble' is being used. When fed into the tube mill the pieces of rock are angular, having flat faces. Within a short time after they are fed into the mill they become well rounded. It is claimed that the angular form is a defect, and great pains are taken to hand-pick stones as well rounded as possible. Now, it seems to me that the grinding efficiency of the angular pebbles would be greater than that of the well-rounded ones. Your expression 'cubes of siliceous rock' would imply that the Ray people would choose square pebbles. What is the real difference in grinding practice between angular and well-rounded pebbles?"

The "cubes of siliceous rock" to which reference was made are used in that shape because it is cheaper to make them round in a tube mill than by other means. The ones referred to were produced by the Jasper Stone Co., of Sioux City, Iowa, and are apparently broken out of solid rock. To make them round would be an expensive process, and, anyway, they quickly wear to that shape after being put in the mill.

We cannot agree with you that the grinding efficiency of angular pebbles would be greater than of spherical, although we have no experimental data to offer to prove the point. If two cubes should impinge on each other, side to side, evenly, of course the crushing efficiency would be high, but this would rarely be the case. With angular faces meeting, the areas between which the crushing or grinding action would take place would certainly be less than is the case with spheres of similar weight. In grinding with balls, although there is theoretically only point contact, a considerable area exists around this contact point which comes sufficiently close to the neighboring surface to crush to the desired size or finer any particle which comes between.

THE PETROLEUM INDUSTRY

The Influence of Faulting in the Illinois Oil Fields

BY H. A. WHEELER
Written for *Engineering and Mining Journal*

FOLDING and faulting have been going on since the Azoic, or the earliest period of geologic time. The primary world-wide movements of the earth's crust that are due to either the slow cooling and consequent shrinkage of our planet or the slow but never-ending emergence and submergence of continental areas result in complex folds or faults, or both, of highly variable magnitude, according to local conditions and distance from the loci of movement. Local crustal movements caused by vulcanism also result in either faulting or folding. That faulting is occurring today is evident by the resulting shocks known as earthquakes.

The relief from the excessive strains caused by the movement of the earth's crust is likely to take the form of folding where the strains are the result of gradual accumulation in areas of continental or semi-continental magnitude. If, on the contrary, the crustal movements are of local character, and especially the result of rapidly increasing strains, the relief therefrom is more apt to prevail as faults, although folding will be a prominent feature. In strains due to vulcanism, the relief through faulting is usually predominant, and folding may even be absent if the formations are of a brittle non-yielding character (limestones and sandstones).

The object of this elementary prelude on the usual origin of folds and faults is to induce the oil geologist to remember that folding and faulting, at least to some extent, are rarely if ever absent in areas of magnitude, and that they have been constantly occurring from the earliest geologic time and are still active in the present psychozoic period. The importance of folding in the concentration of oil and gas into commercial pools is so well recognized that it will not be further considered.

EFFECT OF FAULTS OCCASIONALLY BENEFICIAL

The influence of faults on oil and gas accumulations is highly important, although usually for its negative value. For in most instances faults ruin otherwise favorable structures through leakage, although occasionally they produce commercial oil pools, especially on monoclines. Where faulting has ruined favorable structures, it will usually—if not always—be found to be subsequent to the oil accumulation, whereas, when its influence is favorable, the fault usually precedes the oil and gas accumulation. The relation of the period of faulting in its influence on the oil and gas accumulation depends on the time when the main movement of the fault occurred. Most faults of magnitude are the result of repeated minor movements along a line of weakness that may represent long intervals of time—even up to the present period; and although the individual movements may have been slight, the now large fault represents the integration or accumulation of many subordinate movements.

Similarly, the accumulation of oil and gas pools of relatively recent age—say, since the Cretaceous—probably represents a long period of gradual accumulation that is undoubtedly still going on in some of the very young pools. Most of the large oil and gas pools are geologically very young, or of Tertiary or Cretaceous age, as in Mexico, the Gulf Coast country, California, Wyoming, Russia, and South America.

GUSHERS MORE PREVALENT IN LATER GEOLOGICAL PERIODS

It is highly interesting and extremely important to note that as the older geologic periods are considered the huge gusher type of well becomes less frequent, and the average yield per acre usually shows a large decline, whereas the quality of the oil shows a marked improvement. Almost all the high-grade oil fields are at least as old as the Permian, if not considerably older. Whether this improvement in quality by age is due to slow chemical changes, similar to the well-known gradation and improvement in the solid carbonaceous or coal series through aging, or is caused by the mechanical process of filtration through clays and shales in the probably more frequent migrations that their long life has permitted, is an open question.

As animal and vegetable life has been abundant at least as far back as the Devonian, and consequently there has been ample material since that period to produce large accumulations of oil, it is not unlikely that the lower acre yield of Paleozoic oil fields has been due mainly to leakage through faulting, rather than by outcropping seepage, clogging of the pores by mineralization, or like causes. For the older the formation, broadly speaking, the longer has been the opportunity for it to be faulted.

In considering the influence of faulting in the Illinois oil fields, which in 1907 and for the seven subsequent years was the third largest oil producer in the United States, the general geology is quite simple.

Illinois is an elongated, spoon-shaped basin, the major axis of which trends about 25 deg. W. and is about parallel with the famous Cincinnati anticline or arch, which delimits the eastern boundary of the basin. Its length north and south is about 360 miles and its width at the heel of the basin in southern Illinois is about 90 miles, with a maximum width of 200 miles in the central portion, and contracts to 125 miles at the north end. This basin consists mainly of the Carboniferous or coal measures, which has a maximum thickness of 2,000 ft. in the southern part of the basin and gradually thins and feathers out in the northern part of the state, near La Salle, where the underlying Devonian and Silurian

limestone and shales come to the surface. The Mississippi limestone or Sub-Carboniferous flanks the eastern, southern, and western sides of the basin.

The Illinois coal measures consist mainly of an intercalated series of shales of varying degrees of thickness with subordinate limestones, sandstones, and several coal seams. The measures thicken and increase in number toward the southern and eastern sides of the state. They are covered with a mantle of glacial drift that ranges from 50 to 200 ft. on the north and feathers out near Carbondale, in the southern part of the state, which is the extreme tip of the terminal moraine.

La Salle Anticline Has Justified Early Predictions

On the eastern flank of the Illinois basin is a strong, persistent gently plunging anticline that takes its name from the town of La Salle along the Wabash River. This anticline dips from 50 to 75 ft. per mile in Clark County, increasing southwardly to a maximum of 250 ft. per mile in Lawrence County. It was mapped over fifty years ago by Professor Worthen, the first state geologist of Illinois, and it is nearly thirty-five years since Prof. T. B. Comstock vainly wrote so enthusiastically as to its oil and gas probabilities. Yet since J. J. Hoblitzelle, of Pennsylvania, brought in the first commercial well near Casey, in 1904, the value of the oil produced along this anticline exceeds $360,000,000.

There are two to eight producing sands in the coal measures, the underlying "Chester" and the top member of the "Big" or St. Louis limestone, that produce high-grade oils that range from 30 to 40 in gravity. Since September, 1919, wells have been found in the Trenton limestone, in Clark County, at a depth of 2,200 to 2,600 ft., that came in at 50 to 200 bbl. of dark green, high paraffin oil.

This eastern Illinois oil field is situated along the La Salle anticline, and has a length of seventy miles, with a width of usually two to four miles, except in Crawford County, where a cross anticline seemingly widens it to fifteen miles. Usually, gas is associated with the oil, and occasionally dry gassers occur, but the gas wells are of minor magnitude when compared with the high, consistent yield of the oil wells. Some of the oil sands carried no gas, especially the Bridgeport sand, and its absence in the latter so discouraged some of the old Eastern operators, who opened the field, that they hastily sold out at low prices, fearing that salt water would shortly take the wells. But the well has proved a very consistent, reliable producer, and Bridgeport is one of the few town-lot propositions that has been a real money maker.

Small Faults Probably Permit Oil and Gas Losses

The only large fault that occurs in the eastern Illinois field, as far as I know, is at St. Francisville, at the south end of the district. It is probable that small, minor faults occur, and though they have not been sufficiently large or open to cause a loss of the oil, gas seems to have escaped. In fact, the old town of Oilfield, near Casey, where considerable drilling was done about 1866, was based on oil and gas seepage, indicating at least slight faulting.

The St. Francisville fault abruptly terminates the eastern Illinois field, and although occasional spasmodic pools occur in the Indiana on the southeasterly extension of the La Salle anticline (Princeton, Oakland, Petersburg), they lack the continuity, richness, and reliability of the eastern Illinois field.

As the eastern Illinois oil field is over eighty miles from the dikes and numerous faults in Hardin County, in extreme southern Illinois, and is situated from 125 to 150 miles from the Ozark uplift of Missouri, it should be reasonably free from serious faults, and its consistent, highly satisfactory oil record confirms this opinion.

As the western Illinois oil fields are fifty to one hundred miles nearer the Ozark uplift, faulting is more prevalent and has ruined several structures that otherwise possessed the fundamental conditions for the occurence of valuable oil pools.

Promising Anticline Proves Valueless

Considering specific cases, the O'Fallon anticline was recommended as a promising structure over fifteen years ago by the Illinois Geological Survey, as the neighboring coal mines gave reliable evidence of a strong northeasterly anticline. O'Fallon is fifteen miles east of St. Louis, on the favored east and west B. & O. R.R., on which are situated some of the richest of the Illinois oil pools. Its proximity to the Belleville and St. Louis markets for gas, its excellent trolley and railroad facilities, its favorable fuel and water conditions, have caused various parties to drill twelve wells along this anticline in the last twelve years. No oil or gas was found, as a local fault has not only permitted it to escape, but it is so open that the underground water is in circulation and hence is *fresh*—at least in the Nos. 3 and 4 sands, the usual oil and gas horizons in this part of Illinois. If the water is moving so freely as to be non-saline, the oil and gas have evidently migrated with it, as there is no hope of finding oil where the water is not salty or shows circulating conditions.

At Aviston, fifteen miles east of O'Fallon, in Clinton County, is another well-defined anticline with a sharp reversal to the west of over 100 ft. that caused the drilling of eight wells in 1912, immediately after the Carlyle boom, which latter was on a milder structure about twelve miles further east. Some gas was found at the base of the glacial drift at a depth of 50 to 70 ft. and a little "dead" oil—or a remnant of dark, heavy oil —was found in the No. 3 or "Carlyle" sand, along the crest of the anticline; otherwise the holes were "dusters," but the water was salty.

The occurrence of shallow gas at the base of the glacial clays with the remnant of heavy dead oil in the No. 3 sand, together with the unusual severity of the sharp westerly reversal, strongly indicates a local fault. Though this fault has permitted the escape of the oil and gas, it is not so open as to allow of circulation of the underground waters; hence, the latter are saline.

About six miles east of Aviston is the Breece oil pool, where small amounts of oil are found in the No. 3 sand, with considerable salt water on a weak structure. Twelve miles further east is the Carlyle pool, where 1,000-bbl. wells were found in 1911, with plenty of gas, as also at Sandoval, fifteen miles still further east. It is highly probable that O'Fallon, Aviston, and Breece were rich in oil and gas, like Carlyle and Sandoval, before they were faulted. The nearer one approaches St. Louis, or comes within the influence of the Ozark uplift, the more severe has been the result of the faulting. Thus, O'Fallon is fifteen miles east of St. Louis and not only has all the oil and gas escaped but the water is no longer saline. At Aviston, thirty miles east, the

water in No. 3 sand is salty, but has only remnants of oil. At Breece, thirty-six miles east, there are a few small oil wells; at Carlyle, forty-two miles east, are fine large wells, with plenty of gas, as also at Sandoval, fifty-seven miles east of St. Louis.

Structure, Once Oil-Bearing, Now Without Commercial Oil

Near the town of Waterloo, twenty-five miles south of St. Louis, in Monroe County, Ill., is a heavy fault that parallels an anticlinal fold. The recent finding of a little heavy, black residual oil at 528 ft. in drilling a water well at Waterloo started leasing and drilling, especially as the Illinois Geological Survey regards the structure with favor. To me, the "dead" character and trifling amount of oil (a few gallons) found in the water well strongly suggests that though the structure was once oil bearing, the oil has long ago escaped along the fault, and this trifling remnant is merely evidence that prospecting today is perhaps a million years too late to expect oil in paying quantities. Two deep water wells (over 2,000 ft.) were drilling on a favorable location many years ago at the Waterloo brewery without finding oil or gas, and a more recent test that was drilled for oil about one and a half miles northeast of Waterloo was also unsuccessful.[1]

At Centralia, sixty miles east of St. Louis, in Marion County, there is a heavy northwest fault that breaks through an otherwise large, promising dome on the Sandoval-Irvington anticline. This dome has a westerly reversal of 20 to 40 ft., and the normal average easterly dip of 15 ft. per mile increases to 50 to 125 ft. for five miles east of the apex of the dome. Although this anticline was mapped over fourteen years ago by the Illinois Geological Survey, it was ignored until oil was struck in sinking a coal shaft at Junction City, two miles north of Centralia, on the crest of the anticline. This discovery started drilling, which developed a small pool in the Dykstra, or No. 1, sand immediately under the coal seam and in the Wilson, or No. 2, sand at 700 ft. Although the wells were small, coming in at 5 to 30 bbl., it started prospecting in every direction that opened up the Sandoval pool, four miles north, and the Centralia pool, two and a half miles southeast, of Junction City. The Sandoval pool has been one of the richest and most consistent in the state, producing 50 to 500 bbl. wells from the "Stein," or No. 3, sand at 1,425 ft. and the "Benoist," or No. 4, sand, at 1,550 ft. The wells are still producing 7 to 12 bbl. daily, although over ten years old, and few dry holes occurred inside the pool.

Survey Work Explains the Irregularities of Centralia Pool

The Centralia pool, on the contrary, has been extremely unprofitable and highly erratic, and until recent work of the Illinois Geological Survey disclosed a heavy northwest fault, it was difficult to explain its idiosyncrasies. For, on bringing in a good well in the thick (30 to 40 ft.) No. 4, or Benoist, sand (a true sandstone), drilling a ring of wells around it only one location distant would result in dry holes. Of twenty-five to thirty wells drilled on the Centralia dome, only two good (70 to 80 bbl.) and three small producers have been found. This shows that the few wells represent thick spots, "pimples," in the sand that locally trapped the oil, whereas most—perhaps over 95 per cent—of the oil has been lost through the fault (has continued migrating). This is confirmed by the fact that in the Junction City coal mine, in whose shaft the discovery seepage was found, oil floods the abandoned rooms, showing that it is still ascending the fault that is one-fourth mile east of the shaft. As this fault passes west of Sandoval, it did not affect that field, which is exceptionally rich in gas, whereas there is no gas in the Centralia or Junction City pools. This fault has a throw of over 100 ft. and where offshoots from it extend through the Centralia mine, oil seepage occurs.

At Grafton, on the western side of the state, there is a heavy easterly fault with a throw of about 500 ft. that brings up the Niagara dolomite as steep bluffs amid Mississippi limestone. As the Niagara is saturated with heavy black oil for over 100 ft. on its outcrop, it has caused considerable drilling in the vicinity. As "seeing is believing" with most people, such a strongly saturated oil rock should be underlaid with oil, according to the "tenderfeet" who drilled nine dry holes, although warned by a geologist that this fault had ruined the pool that probably existed there in preglacial times.

Favorable Oil Structures Spoiled by Faulting

There are numerous small domes and local anticlines in the southern part of Illinois, in the heel of the spoon or basin, where the dip is ample (40 to 200 ft. per mile) to form oil and gas pools and that have caused the drilling of many wells—some of which were judiciously located on good structures. To date (December, 1920) no paying oil wells have been found, although many of the tests were deep enough to reach all the known producing horizons of Illinois. The great prevalence of faults in this district, due to its close proximity to the Ozark uplift (twenty to fifty miles), explains this lack of success and renders the future decidedly discouraging in a district otherwise more favorable than further north, from the greater number and thickness of the sandstone horizons.

The age of the Illinois faults cannot be determined closer than that they are Post-Carboniferous and Pre-Glacial, for they break through the highest members of the coal measures, but do not disturb the overlying glacial drift. As this represents a long period during which the Permian, Triassic, Jurassic, Cretaceous, and Tertiary sediments were being deposited in other portions of the continent, it leaves much room for speculation as to when the faulting occurred. Though the faulting was subsequent to the folding, it scarcely narrows the broad range during which the faulting may have occurred. I regard the heavy faults at Grafton and Waterloo as representing the accumulation of successive movements from at least Cretaceous times, if not considerably earlier, as an old line of weakness or relief, whereas the numerous small minor faults found in western Illinois are probably much younger, if not very recent in some cases.

In any event, the Illinois faulting was subsequent to the accumulation of the oil and gas pools, and hence has thus far been found to ruin—through leakage—otherwise promising structures. The Centralia fault is so recent that all the oil has not yet completely escaped, as a small amount—enough to make a few wells—still remains, and the accumulation in the worked-out rooms of the Junction City coal mine shows that the oil is still migrating.

[1] A recently completed well on the crest of the anticline found only about half a barrel of heavy oil.

NEWS FROM THE OIL FIELDS

Boyd County, Ky., Brings in Two Wells

From Our Special Correspondent

Boyd County, Ky., is beginning to attract attention of oil prospectors and investors since the Good Loser's Oil Co. has brought in two good wells in that territory and is drilling a third. Well No. 2 was put under the pump, and in four days it pumped 82 bbl. of oil. The well on the Kirk-Queen property in the same locality has been tubed. This well is good for 20 to 25 bbl.

Another big oil well is reported from Warren County. This new strike, on the Vierling lease in the Oatsville pool at a depth of 1,652 ft., is reported to be making 600 bbl. natural flow without shooting.

The Union Gas & Oil Co. has completed its No. 1 on the C. C. Rose lease, Keaton's Fork, which is reported good for 10 bbl. This lease is in Johnson County.

On the Kendall Williams lease, at the head of Big Mud Lick, operators have brought in a well in the Berea sand, which is reported to be good for 5 to 8 bbl. This is a new wildcat well, three miles from any production, and extends the field.

Pittsburgh operators have recently opened a new oil pool in Green County. The initial well was brought in on the Gowan farm, and is reported to be good for 25 to 30 bbl. There are fourteen producing wells in Green County.

Honolulu Consolidated Oil Co. Granted Leases

Secretary Payne, on Dec. 23, authorized leases to the Honolulu Consolidated Oil Co. of its known producing wells. The company, after denial of its applications for patents last spring, applied for leases under the new Leasing Act. Its lease applications were protested by the Navy Department, the Buena Vista Land and Development Co. claiming under state selections, and by various individuals claiming under the mining laws. The Navy Department had objected to the leases on the ground that the company was not entitled to leases under the terms of the act. In addition, as to certain wells, it alleged there was no production, and that therefore those wells were not subject to lease.

It is reported that the Midwest Refining Co. is preparing to drill a well in wildcat territory fifteen miles west of Cortez, Montezuma County, Col. This will be east of the San Juan, Utah, district and north of the Aztec, New Mexico field.

Canada Orders Crown Reservation on Oil Locations

From Our Special Correspondent

An Order-in-Council has been issued by the Canadian government reducing the area of petroleum and natural-gas locations which may be acquired in the Mackenzie, Franklin and Keewatin districts of the Northwest territories. The maximum area which may be staked, which was formerly 1,920 acres, has been reduced to 640 acres, but it is provided that the area so located shall be divided into two equal parts, one of which shall be reserved for the Crown. The applicant is to make an affidavit that the tract selected as a Crown reservation is as favorable for the discovery of petroleum as that which he has applied to lease. Should oil be discovered in commercial quantities, the lessee of the location on which the discovery was made is entitled to a lease of the Crown reserve, provided that no other discovery has previously been made within a distance of 100 miles.

Mid-Kansas Co. Brings in a Good Well

From Our Special Correspondent

One of the most important completions in north Texas for some time was made recently by the Mid-Kansas Oil Co. in its No. 3 Hull well, in the Eliasville-Ivan district of Stephens County, making 2,500 bbl. daily. Two other wells, the Mid-Kansas G. W. Hill and the Prairie Oil & Gas Co.'s J. W. Hill, were also brought in, making 300 and 500 bbl. respectively. The G. W. Hill well is 3½ miles northeast of the Texas Co.'s wells on the Black brothers' ranch. The oil in all of them is found in a loose gray limestone like that of the Burkburnett district, and it is believed that a large field of good life will be found here.

Utah Cannel Coal Rich in Oil

From Our Special Correspondent

A possible new source of oil in Utah is suggested in cannel coal, so far proved in a 5½-ft. seam in a small area a few miles square in the Colob coal field, which extends from Cedar City south to Kamarra and from there southeasterly to Mount Carmel in Kane County, and estimated by the U. S. Geological Survey to contain 2,672,000,000 tons. The particular deposit referred to is found at the head of the north fork of the Virgin River above Zion Park. A sample of the coal taken by C. A. Allen and submitted to the Bureau of Mines for analysis was found to yield oil at the rate of 68.8 gal. per ton.

Toll Charged on Mexican Oil Roads

From Our Special Correspondent

The Mexican Gulf Co. is now placing a toll on all hauling being done on its road from Mamez to Chinampa, and the Aguila Co. has added several new toll gates along its road to Zacamixtle.

The Mexican Gulf Co. drilled in its well on Lot 251, Amatlan, on Dec. 12, and it is said to be good for about 50,000 bbl. daily. This lot is next in line south for the encroachment of salt water, and this well will probably not last more than four months. This makes the tenth big producer on this lot.

The Company Mexican Petroleum, "El Aguila," brought in its big well which offsets the Cias del Agwi well in the Federal zone on Dec. 12 also. The well is said to be good for about 50,000 bbl. per day.

Wyoming Items

The Iowa-Wyoming Co.'s well on Sec. 10-29-81 of the Bolton Creek field, Wyoming, is making a good production of black oil by pumping.

On the Sherard Dome, Carbon County, the Kasoming Oil Co. has struck oil at 1,800 ft. in its third test in this field. The well is on Sec. 2-25-89. Two previous wells were abandoned on account of water and caving. The Blair Oil Co.'s well in the Lost Soldier field, also in Carbon County, is flowing by heads from 1,210 ft.

Drilling for oil, for the most part with light rigs or rotaries, is in progress in four widely separated Nevada fields, and only one hole has attained a depth of 1,000 ft. At Fallon a few rigs are drilling, and a little oil was taken in the bailer at a depth of 1,100 ft. The Fish Lake Valley field, west of Tonopah, reports a 900-ft. well flowing water with a little oil. At Illapah, similar conditions are reported. This field is in the extreme eastern part of the state. A standard rig has been moved to the Black Rock Desert field, in western Humboldt County.

The Standard Oil Co. of California has taken first steps to get into a position of advantage for Oriental trade and to relieve pressure upon its California supplies by drilling on the Bondoc peninsula, Island of Luzon, Philippines. Twenty-seven drillers sailed from San Francisco early last month. The work will be done by the Richmond Petroleum Co., a subsidiary which has been conducting the Standard's wildcat work in Colorado and New Mexico.

ECHOES FROM THE FRATERNITY

SOCIETIES, ADDRESSES, AND REPORTS

Executive Board of American Engineering Council Organizes

Territorial Organization Discussed and Referred to Special Committee—Part of Engineering Council's Functions To Be Assumed —Publicity Fund Voted

Herbert Hoover, president of the Federated American Engineering Societies, presided at the executive board meeting of the American Engineering Council of that organization, held in New York City on Friday, Dec. 17. Every member of the council was present, with the exception of A. M. Greene, and two new members of the board were elected: W. B. Powell of the Buffalo Engineering Society, representing district 1 (New York and the New England states), and Gardner S. Williams, of Grand Rapids Engineering Society, representing district 2 (Michigan, Wisconsin and Minnesota).

The president appointed the following standing committees: Procedure, Calvert Townley, chairman; Herbert Hoover, ex officio; W. E. Rolfe, D. S. Kimball, J. Parke Channing, L. W. Wallace and L. P. Alford. Constitution and By-laws, W. B. Powell, chairman; C. F. Scott and D. S. Kimball. Publicity and Publications, L. P. Alford, chairman; H. W. Buck and H. E. Howe. Membership and Representation, J. F. Oberlin, chairman; L. W. Wallace and A. S. Dwight. Finance, William McClellan, chairman; E. Ludlow, C. Townley and L. W. Wallace, ex officio. Public Affairs, J. Parke Channing, chairman; Fred J. Miller and L. B. Stillwell.

In discussing the program of the council immediately under consideration Mr. Hoover stated that he had called engineers together in various cities he had visited lately and that he found that the general desire of engineers everywhere was to join in the F. A. E. S. movement, but that the general trend was for territorial organization as distinguished from national organization. One of the stumbling blocks in the way of these territorial organizations joining the national organizations was the question of dues. Another complexity was that individuals hold memberships in more than one society. For example, the Western Society of Engineers has about four thousand members, of which three thousand are already members of national societies who have affiliated with the F. A. E. S. Mr. Hoover also stated that there had been some opposition to the Federation based on the constitution, but that the question of territorial organization was the most important, and he suggested that a committee should be appointed to canvass and help the situation. This question was discussed and referred to a special committee, which will include the six district delegates.

As a step forward in co-ordinating various intersociety activities already established the necessary action was taken to make it possible for certain of the activities of the Engineering Council to be taken over by the new organization. As soon as the United Engineering Societies have passed officially upon the proposed action of the Engineering Council to transfer and continue the work of the Engineering Council's committees which have not yet completed their work the president will appoint the necessary committees of American Engineering Council to take over this work. At the meeting of the Engineering Council held in Washington there was harmony among all the member societies in the Engineering Council to this end. In this connection action was taken to amend section 9, paragraph 6 of the by-laws so that members of committees can be selected from societies of the American Engineering Council other than those at present members of the Federation. Civil engineers and engineers in other bodies not at present affiliated with the Federated American Engineering Societies can because of this action co-operate in the committee work.

The four so-called founder societies in addition have been associated in a common employment service, and the American Engineering Council has offered to take over this service.

The American Engineering Council voted to act independently as a unit and not to affiliate with the United States Chamber of Commerce. It was the thought of the meeting that the council could make its best contribution to the public by acting independently.

The council authorized the appropriation of $1,000 as an initial fund to carry on publicity work and the committee on publicity and publications was given authority to set up a board of engineering editors.

It was voted that full expenses of members of the executive board for attendance at meetings would be paid by the Council.

A special committee reported on candidates for permanent executive secretary of the organization, but no final action was taken at the meeting.

A general feeling was expressed that the meetings of the board should be held at different centers and the place of the next meeting, which will be held on Feb. 11, was left at the discretion of the president.

The Globe-Miami chapter of A. A. E. recently elected T. K. Scott, president; E. L. Evans, vice-president; R. S. Allen, secretary; C. S. Elayer and J. V. Booth, directors.

Interesting Practical Papers Read at December Meeting of I. M. & M.

The Institution of Mining and Metallurgy held its meeting of Dec. 16, last, at the rooms of the Geological Society, Burlington House, Piccadilly, W. 1. R. E. Palmer presented interesting and suggestive "Observations on Mining by the Opencast or Stripping Method," commenting on the most economical and practical slopes for the excavation made in various materials to different depths, aiming at orebodies of various cross-sections and attitudes. He concluded with an appeal to mining engineers "for the adoption of a uniform standard unit of measurement when referring to materials removed by opencast for winning ore." For example, United Verde Copper Co. recently stated that it is to remove "twenty million *tons* of overburden to uncover five million tons of copper ore," and he asks "What is a ton of overburden?"

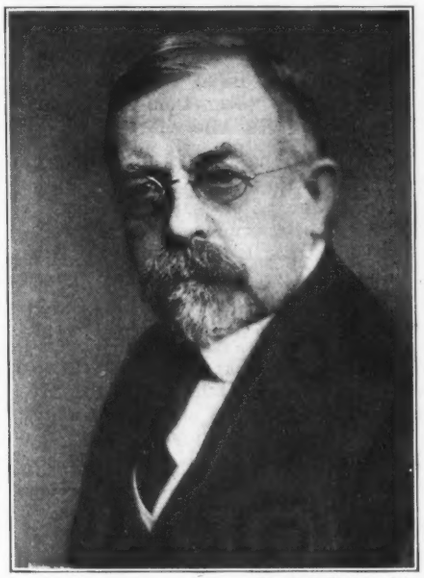
A second paper was presented by E. J. Pryor, student member, who discussed "Some Sources of Error in Alluvial Boring," drawing on his experiences in low-grade alluvial tin deposits with "Empire" and "Banka" types of drills. He finds the main sources of error in boring different ground are: Obstructing stones in the gravel; obdurate and sloping bedrock; the surge effect of the sand pump; and the human equation of the gang at work. Another small source of error is found to be the secret enriching or "salting" by the gang in order to keep the white "boss" or overseer in good temper.

Increasing Bauxite Traffic

A great impetus has recently been noted in the development of the traffic in bauxite ore from southern France, according to *The World's Markets*. Since the first of 1920 about 12,000 tons has left French ports for the United States, the analysis of the best grades of ores running well over 60 per cent alumina. There are thousands of tons of this high-grade ore lying at the base of supply, awaiting shipment, but transportation conditions are bad. This causes the rejection of lower content ores. The presence of reduction plants on the spot in the port of St. Raphael, for instance, would reduce costs of transport about 40 per cent. Both British and American interests are looking to this end. The French bauxite contains as high a content as American aluminum ores, and should the same processes of reduction be used in the French fields, it is possible that the run of low percentage content could be used. Activities in the southern French fields are greater today than ever.

MEN YOU SHOULD KNOW ABOUT

John H. Means, who has been acting chief engineer of War Minerals Relief Commission since W. R. Crane resigned, has been designated by the Secretary of the Interior to be chief engineer of that commission. The position is of particular importance at this time, owing



Harris & Ewing, photo
JOHN H. MEANS

to the fact that the commissioners will disband soon, leaving the winding up of the affairs of the commission in the hands of the chief engineer.

Mr. Means is a native of Vevay, Ind. He was graduated from the state university of Indiana, but received his mining education at Leland Stanford, Jr., in California. His first technical service was with the California State Mining Bureau. Later, he entered private consulting work as a mining engineer and examined many properties in California and throughout the West.

Mr. Means subsequently engaged in mining engineering work in China and Japan, after which he went to London, where he maintained an office until the outbreak of the war. He returned to the United States and took up war work for the Government. Prior to his connection with the War Minerals Relief Commission he was connected with the war minerals investigations for the Bureau of Mines.

Harry J. Wolf, of New York City, has returned from a trip to Bethlehem, Pa.

M. T. Hoster, superintendent for the E. & G. Brooke Iron Co., Saint Peters, Pa., was in New York this week.

After nine months of geologic work in South America, **E. W. Shaw** will resume his regular duties as oil geologist with the U. S. Geological Survey, on Jan. 3, 1921.

George Guess, professor of metallurgy at the University of Toronto, is chairman of the Toronto branch of Canadian Institute of Mining and Metallurgy.

Gerald R. Simpson has resigned as superintendent of Standard Minerals Co., Kingman, Ariz. He will devote his attention to the manufacture of his pneumatic flotation machine.

H. Foster Bain, of Washington, D. C., addressed the New York section of Mining and Metallurgical Society on Dec. 29. His subject was "Problems Fundamental to Mining Enterprise in the Far East."

H. C. McClain, superintendent of the Liberty Bell Gold Mining Co., at Telluride, Col., has resigned that position and gone to Salida, Col. From there he will proceed to Salt Lake City, Utah, on professional business.

R. M. Wolvin, president of Dominion Steel Corporation, and **D. H. McDougall,** president of Nova Scotia Steel & Coal Co., sailed for England recently. Both are going across on the affairs of the British Empire Steel Corporation.

William P. Rutherford, managing director of the Tharsis Sulphur & Copper Co., Ltd., Glasgow, has been appointed to succeed the late Lord Glenconner as chairman of the directors of that company.

H. H. Claudet, mining engineer, of Ottawa, Canada, who has had charge of the local branch of the General Engineering Co., Inc., took over the Ottawa office and laboratory on Jan. 1, 1921. Mr. Claudet is now carrying on that business independently.

John M. Hayes, retiring after years of service as treasurer of the Utah Copper Co., was the guest of honor at a dinner at the Alta Club in Salt Lake City, Utah, on the evening of Dec. 22. A number of officials of the Utah Copper Co., of the Bingham & Garfield R.R., and other friends were present.

Max H. Barber, district superintendent, and **William R. Meyers,** assistant district superintendent, of the Mesabi iron range for the Cleveland-Cliffs Iron Co., have gone to Ishpeming, Mich., to confer with M. M. Duncan, vice-president and general manager of that company. Mr. Meyers will visit Louisville, Ky., before returning to Hibbing, Minn.

Dr. Frank Dawson Adams, dean of the faculty of Applied Science, McGill University, Montreal, since 1908, and Logan professor of geology since 1894, has been appointed vice-principal of the university, in succession to Dr. C. E. Moyse, who resigned in June, 1919, after holding that position for seventeen years. Professor Adams was president of the Canadian Mining Institute in 1910, is a fellow of the Royal Society (London), and an honorary member of the Institution of Mining and Metallurgy of Great Britain. He has devoted himself to the study of igneous rocks and crystalling schists, and has made notable experimental research concerning the movements of rocks under great pressures.

Mining Men Visiting New York City recently included: H. Foster Bain, Washington, D. C.; E. Perry Smith, Allendale, N. J.; Roy N. McBride, Abengany, Costa Rica.; C. R. Raiter, Minneapolis, Minn.; George Fairbairns, London; J. S. Yardley, Pittsburgh, Pa.; John E. Hodge, Minneapolis, Minn.; George Lyman Clark, Lincoln, Neb.; E. W. Engelmann, Salt Lake City, Utah; David Tamor, Pittsburgh, Pa.; Lieut. James W. Rice, Edgewood Arsenal, Md.; Mortimer A. Sears, Huntington, W. Va.; Warner McLaughlin, Port Henry, N. Y.; Harold C. E. Spence, Egerton, Nova Scotia; J. M. Henderson, London; L. A. Lajat, Milltown, N. J.

George A. Parks, mining engineer, of Juneau, Alaska, recently has been chosen by the Secretary of the Interior to head an interdepartmental committee charged with the duty of stimulating the development of Alaska and the simplifying of the relations between the executive departments and the territory. One of the important things which the committee is to do is to encourage particularly those industries best calculated to furnish tonnage for the Government railroad. This means the stimulation of mining along the Alaskan line, as the hope of sufficient tonnage to make the railroad self-sustaining lies in the mining industry.

Mr. Parks was born in Denver. His early education was obtained in the public schools of that city. He was graduated from the Colorado School of Mines in 1906. Immediately thereafter he entered the employ of an English corporation and worked in the states of Jalisco, Hidalgo, and Sonora, in Mexico, and afterward went to Alaska

Harris & Ewing, photo
GEORGE A. PARKS

with the same company. In 1909 he resigned to become engineer in Alaska for the General Land Office. He has held that position since, and with the exception of the time while he was in the military service, during the war, he has resided continuously in Alaska.

THE MINING NEWS

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LEADING EVENTS

Bill for Licensing Engineers Ready for Minnesota Legislature

A bill for the registration and licensing of engineers, architects and land surveyors has been formulated by the state legislative committee of the Minnesota Joint Engineering Board after many conferences and careful study. It will be presented to the State Legislature this winter. The bill follows very closely the model bill of the Engineering Council and at present it is being presented to the various engineering societies of the state for their approval or recommendations.

The Minnesota section of the American Institute of Architects framed a bill last winter for the registration of architects which was presented to the State Legislature and passed the House of Representatives but did not come up before the Senate due to a rush of business during the last days of the session. It would come up as unfinished business at the approaching session of the Legislature had it not been recalled by the Institute of Architects. After the Minnesota section had accepted the invitation of the Minnesota Joint Engineering Board to become a member of the board and both parties realizing the many disadvantages of two registration laws, the bill presented by the Architects was recalled by them. The combined energy of all technical organizations, will be concentrated on the one bill.

The new bill provides for a registration board of seven members appointed by the governor, prescribes fees, states who may be registered with definite qualifications and who are exempt from certain provisions of the act, and permits corporations and partnerships to practice. In general the bill is considered of paramount importance. At present there are eleven states that have laws that require the licensing and registering of engineers and architects and six states have such laws under consideration. The proposed bill is not drastic or too discriminating inasmuch as it does not prohibit the designing or execution of work by any one, provided that his plans and specifications are not signed by the author as "Registered Architect," "Registered Professional Engineer" or "Registered Land Surveyor." Any unexpired certificate issued by any state or territory of the United States, or in any province of Canada will be recognized by the Minnesota law provided that the requirements for the registration of architects, professional engineers and land surveyors are of a standard satisfactory to the examining board that shall be appointed.

WEEKLY RÉSUMÉ

The petition of Karl Eilers for a writ of mandamus directing the American Smelting & Refining Co. to open to him its stock books was denied by Justice W. P. Burr, Jr., in the New York Supreme Court. Four corporations, including the National Lead and Eagle-Picher companies, have been accused before a committee in New York that is investigating the building trades of fixing the price of white lead, the manufacture of which they are said to control. Reports have been verified that the Mexican government has removed the export duty on copper and its ores and concentrates as an aid to producers, effective when copper is below 15c. and retroactive to Dec. 1. A new schedule of freight rates on Coeur d'Alene ores, agreed upon by shippers and carriers, has been disapproved by the Interstate Commerce Commission. In comparison with this is the reduction in rates recently allowed between the Mason Valley smelter and copper camps in Plumas County, Calif., in consequence of which the smelter is to be remodeled. The U. S. Supreme Court has refused to review the Star-Federal apex case. It is reported that a bill providing for the licensing of engineers is ready to be presented to the next Minnesota Legislature. In California, the Fremont Consolidated Mines have been acquired by Bulkeley Wells and associates. In Nevada, the Goldfield Development Co. has purchased the Gold Hill mine.

At Washington, the President was expected to sign the bill allowing six months' grace for assessment work, before the end of the year 1920.

Utah Companies To Seek Higher Tariff on Lead

Producers of lead in Utah are desirous that Congress shall impose a higher tariff on lead. It is felt that operation at present prices is impossible. A committee has been appointed to collect data for presentation to Congress. The members are: Ernest Bamberger, chairman; W. Mont Ferry, Frederick Cowans, E. J. Raddatz, Imer Pett and George W. Lambourne.

Control of American Smelting & Refining Co. Defended

Court Refuses To Issue Writ—Access to Stock Books Never Denied Eilers, It Is Alleged

Argument on the application of Karl Eilers for a writ of mandamus requiring the American Smelting & Refining Co. to permit him to inspect its stock books (see *Engineering and Mining Journal*, Dec. 25, 1920, p. 1229) was heard in New York on Dec. 22 by Judge William P. Burr. The petition was denied. It was specifically denied by the company that permission to inspect the books had been refused Mr. Eilers. It was further stated by counsel for the smelting company that Mr. Eilers had been given access to the books since the proceeding was brought and was even then engaged in making the desired list. The good faith of the application was challenged, the company's counsel charging that Mr. Eilers' object in seeking the writ was to "use a judicial proceeding in a campaign for votes so as to escape the consequences of libellous accusations."

Edgar L. Newhouse, chairman of the board of the American Smelting & Refining Co., made return to the petition for the writ on behalf of the corporation. Excerpts from his statement follow:

". . . The original election of Mr. Simon Guggenheim to succeed Mr. Daniel Guggenheim as president of the company on Jan. 21, 1919, represented the free and unanimous choice of the directors of the company. It is not true that the board of directors were given no opportunity to express any wish in the matter. The re-election of Mr. Simon Guggenheim as president of the company thereafter likewise represented the free and unanimous choice of the directors, save in the case of Mr. Eilers. . . .

"It is true that since their association with the company the Messrs. Guggenheim, or some of them, especially Mr. Daniel Guggenheim, Mr. Murry Guggenheim and Mr. Simon Guggenheim, have exerted a weighty influence in the counsels and management of the company. It is not true that the Messrs. Guggenheim, or any of them, dominated the directors and officers of the company in the injurious and objectionable sense in which the term is employed in the petition. Such position of influence and authority as they held was altogether due to their great

abilities, their unusual knowledge of the business and their singular qualifications as directors in the enterprise. It was in no wise due to arbitrary methods or to artificial means of control. . . .

"It is not true that the Messrs. Guggenheim, though continuing to act as directors, ceased to hold stock in the company except in a negligible amount. On the contrary, they have always been substantially interested as stockholders in the company.

"The only member of the Guggenheim family who is now an officer of the company is Simon Guggenheim, who is president and is the owner of over 20,000 shares of the common stock of the company and, so far as deponent has been able to ascertain by investigation, is the largest single stockholder of the company, the total holdings of said Simon Guggenheim and his wife in common and preferred stock being in excess of 28,000 shares. Isaac and Daniel Guggenheim are directors but not officers, and draw no salaries. Their aggregate holdings of stock of the company are in excess of 8,000 shares. It is not true that any of the Messrs. Guggenheim ever received salaries from the company while not rendering commensurate service. . . . No salary is paid by the company to any of the Messrs. Guggenheim other than to the president of the company, Mr. Simon Guggenheim. . . Especially is it denied that the Messrs. Guggenheim, or any of them, during their association with the company acted in disregard of the interests of the corporation or sought to employ it to serve their own ends. . . .

Tin Operations in Bolivia Explained

"The facts as to the company's activities in Bolivia are that prior to 1910 the company had never smelted tin nor had tin been smelted in the United States to any substantial extent by anyone. The company was then engaged in smelting and refining silver, copper, lead and other ores. In 1910 Messrs. Newhouse and Stewart, officers and directors of the company, went to South America for the purpose of obtaining contracts for the smelting of ores other than tin, at the company's plant at Tacoma, Wash. They did not while there investigate mining properties of any kind for purchase. While in Bolivia they became convinced that it would be to the advantage of the company to add the smelting of tin to its other smelting activities and upon their recommendation the company built a tin smelter at Perth Amboy, N. J., and entered into contracts with tin mines in Bolivia for the smelting of their ores and that business has been carried on up to the present time. It is true that a number of years later an examination of one or two tin properties in Bolivia was made for the company, but a majority of the board was opposed to the company's investing money in any tin mines in South America, and no such mines have ever been acquired by it. None of the property in Bolivia so examined for the company, or the purchase of which was considered by directors and officers of the company, was ever purchased by the Guggenheim Brothers, or by any member of that family. I deny that any demand was made by directors of the company that the company be allowed to share in Guggenheim Brothers' operations in Bolivia, or that any such demand was refused by the Messrs. Guggenheim.

Interest in Premier Bought To Secure Smelting Contract

"With reference to the Premier silver and gold mine in British Columbia, the company's interest in making any investment therein was primarily to insure to itself the smelting and refining of the ore from that mine. Officers and directors of the corporation, other than the Guggenheims, were opposed to the investment of a sum of money as would be required to purchase a one-fourth interest in the mine which was the interest offered to the company by owners of the property. On the other hand, it was necessary for the corporation to arrange for the purchase of at least a one-fourth interest, if any interest was to be acquired, as the sellers did not desire to sell a smaller interest. The smelting company therefore solicited, through its Mr. Guess, the head of its mining department, the Guggenheim Brothers to purchase a one-half of the one-fourth interest offered, thereby relieving the company of the necessity of purchasing more than the remaining one-half of the one-fourth and this arrangement was informally approved by all of the directors of the company except possibly Mr. Eilers, and I have no recollection of Mr. Eilers ever objecting at the time or until this action. . . .

Selling Copper for Future Delivery Necessary

"The allegations of the petition in respect to sales of copper are incorrect and misleading. By far the greater amount of copper sold by all large copper producing and selling companies is sold for future delivery, and owing to the custom of the trade and the requirements of the copper market, it is impossible for any company having a large output of copper to sell more than a comparatively small part of its production by current sales, such as are possible in other metals. Moreover, the volume of copper to be sold by the company has included, since about the year 1908, not only its own copper, but also copper sold by it as selling agent for a number of large copper producing companies, the selling agency arrangement having been made as part of arrangements to smelt and refine the ores of such companies, so that this company receives, in addition to its profit from its operations upon the ore, a separate and additional commission for the sale of the copper. The selling agency arrangement provided that the company sold its own copper, together with the copper of the companies for which it acted as selling agent, all sales of copper being pro-rated against the total amount of copper available for sale at any particular time, including the company's own copper. The net proceeds of the commissions paid to the company for its services as selling agent for other companies amounted, in the period from Jan. 1, 1913, to Sept. 1, 1920, to a sum in excess of $10,000,000, and the conducting of such agency proved to be, during normal times, a source of large profit to the company. The existence of the agency, however, increased the necessity and volume of forward sales of the company's own copper, and particularly in the abnormal period following the outbreak of the European war it is true that some losses were suffered from this source. These quotational losses were due almost entirely to the existence of the selling agency. The statement made by Mr. Hills, the comptroller, as of Oct. 31, 1920, which is apparently the statement referred to at folio 28 of the petition, shows that from Jan. 1, 1912, to Oct. 31, 1920, the net proceeds from the selling agency amounted to $10,046,409, and that from this should be deducted quotational losses incurred during the same period amounting to $4,594,824, leaving an apparent net profit for the period on the operation of $5 451,585. But this apparent profit will at present prices of copper be more than wiped out by quotational losses which will be suffered if the present dull copper market continues.

Copper Accumulating Caused by Lack of Demand

"The statement that in April, 1920, as the result of a policy of withholding copper from sale, the company had on hand approximately 160,000 tons of refined copper is absolutely untrue. On May 1, 1920, the company had on hand for its own account 26,855 tons of refined copper. This accumulation was not due to any policy of withholding copper for sale, as the company had used its best efforts to sell all the copper it could, but was due, first, to lack of demand because of the fact that all consumers of copper were overstocked; second, to the fact that during the war production was greatly stimulated because of the war demand, and a large amount of copper ore came through after the signing of the Armistice in a volume much larger than during normal conditions; third, to the fact that labor and railroad conditions during the war and after the signing of the Armistice were such as to lengthen the period between the delivery of ore to the company and the arrival of the refined copper at tidewater; and, fourth, to the fact that the company was not free to sell its own copper, independently of the copper of the companies for whom it acted as selling agent, since, under the selling agency agreements, the company's own copper had to be sold pro rata with that of all of the companies for whom the company acted as selling agent, and the aggregate amount which thus had to be sold was much greater than the market has

been able to absorb during the conditions existing since the signing of the Armistice. All of these were conditions which were due to the abnormal times and for which the officers of the company were in no way responsible. The conditions experienced in these abnormal periods by this company have been common among companies in the same business.

"The officers and directors of the company have from time to time during the past two years made efforts to work out a modification of the selling agency contracts which would leave the company the profits from its commissions as selling agent in normal periods and at the same time leave it free to sell its own copper independently during times of abnormal conditions, but, although the greatest efforts were made by the company's officers to that end, this finally appeared not to be practicable, and as the end of the abnormal conditions are not yet in sight, it was determined by the board of directors during the month of November, 1920, to terminate the selling agency, which was accordingly done.

"In other words, the company's selling agency was originally attractive and profitable to it, and during normal times resulted in large net profits accruing from the selling commission. The unprecedented abnormal conditions which arose during the war and again since the signing of the Armistice have created a situation which could not have been foreseen, and the result of which has been to offset quotational losses against the profits thus accruing, and no one can now foresee when normal conditions in the industry will return. The company's board of directors has, in order to prevent further losses from this source, deemed it to the advantage of the company to terminate the selling agency, so that hereafter the company will sell merely its own copper, unrestricted by obligations to sell the copper of any other company.

"The various changes in the board of directors and in the officers of the company, referred to in the latter part of the seventh paragraph of the petition, took place, but the reasons therefor, and the inferences therefrom as stated in the petition, are wholly imaginative. . . ."

Case of Bacon vs. Neill Before Federal Court

The case of M. W. Bacon vs. R. K. Neill opened before Judge Frank H. Rudkin, U. S. District Court in Spokane on Dec. 14. The defendant, Neill, is one of the principal owners of the Premier mine near Stewart, B. C. Bacon is suing for a half interest in this property, claiming to have entered into a mining partnership with Neill just before the latter examined the Premier in June, 1916. The case has attracted wide attention by reason of the value of the property, in which the American Smelting & Refining Co. and Guggenheim interests hold a quarter interest.

Lead Companies Accused of Fixing Prices

Four Largest Manufacturers of White Lead Alleged To Have Formed Illegal Combination

Four companies control the manufacture of 95 per cent of the white lead made in the United States and fix prices through the American Institute of Lead Manufacturers, according to evidence placed on Dec. 23 before a committee in New York that has been investigating building trades conditions. These are the National Lead Co., the Eagle Picher Co., of Chicago, the Sherwin Williams Paint Co. and the du Pont de Nemours company, of Wilmington, Del. According to reliable reports of the hearings in the daily press, prices were fixed through the medium of the National Lead Co., which is said to have acted as pacemaker, and which notified the institute of changes. According to the testimony, the price of white lead has risen from 6c. a pound in 1916 to as high as 15½c. last month. The sales of this material by the National Lead Co. alone amounted to over $21,000,000 in eleven months of 1920.

I. C. C. Disapproves New Schedule for Cœur d'Alene Ores

Action Surprises Railroad Companies and Shippers—Doubt Bullion Rate Will Be Lowered

A new schedule of freight rates on ore from points in the Coeur d'Alene district to the smelters at East Helena, Mont., and Northport, Wash., which was agreed upon by the railroad companies concerned, was rejected by the Interstate Commerce Commission, much to the surprise and disappointment of the carriers, the mining companies and the people of the district generally. So certain were the railroad companies that the new freight tariff would be approved that one of them at least had supplied its agents with the printed schedule effective Dec. 27. The carriers are said to realize that a substantial reduction must be made if the mines continue in operation and they took the initative in cutting the rates on ore to the smelters. They are also working out a reduced rate on pig lead from the smelters at East Helena, Northport and Kellogg, Idaho, to the Atlantic seaboard, but the turning down of the proposed reduced ore rates makes doubtful the attitude of the Interstate Commerce Commission toward a lower rate on bullion.

Tin Smelting Company Fails

A petition in bankruptcy has been filed by American Tin Smelteries, Inc., of 10 Wall St., New York. The company's liabilities are $90,213, of which $80,888 are unsecured claims. Assets are put at $187,664, the main item of which is real estate, plant, etc., consisting of 16¼ acres in Matawan township, N. J., listed at $150,700. John S. Dickerson and Middleton S. Bosland have been appointed receivers.

Star-Federal Apex Case Not To Be Reviewed by Supreme Court

Decision of Court of Appeals Favoring Star Stands—Case Closed

The Supreme Court of the United States has refused to review the decision of the Court of Appeals at San Francisco in which that of the Federal Court for the district of Idaho was reversed in the case of the Star Mining Co. vs. the Federal Mining & Smelting Co. The Star company alleged that the Federal company, in operating the Morning mine, had entered upon the ground of the plaintiff and removed therefrom ore valued at more than $500,000, and asked for judgment for the full amount removed together with interest and costs. The trial involved the question of apex to the vein, the Federal contending that it was within the Grouse and Iron Crown claims while the Star held that it was within the Evening Star and Mary R. Fraction claims. The case was tried in Wallace, Idaho, before Judge F. S. Deitrich, of the Federal court, and both sides were represented by attorneys, mining engineers and geologists of national reputation. Judge Deitrich decided the case in favor of the Federal. The decison turned on the question of priority of location as between the Grouse and Evening Star claims, the court holding that although the fact that the Grouse was patented first did not necessarily establish its priority, the fact that the application for patent was known to the Evening Star owners and that they failed to take adverse proceedings justified the presumption that they conceded priority to the Grouse and the court so ruled. The Star company carried the case to the Court of Appeals, which reversed the lower court, holding that there was no warrant for a presumption in favor of the Grouse, since it was shown that the Evening Star was first located and had the first statutory mineral discovery. The Federal company then applied to the Supreme Court of the United States for a writ of certiorari, which has now been denied, thus affirming the decision of the appellate court.

Lake Ore Shipments in 1920

Final figures for the 1920 Lake movement of iron ore show that a total of 58,527,226 tons was transported down the lakes during the 1920 season. These figures will be augmented by about a million tons when the all-rail shipments, which will be available at an early date, are added. The December movement amounted to only 99,146 tons. The shipments by ports were as follows: Duluth, 15,479,334 tons; Two Harbors, 9,278,464; Superior, 14,812,398; Ashland, 8,180,752; Escanaba, 7,361,070; Marquette, 3,415,108. As usual, the Mesabi Range led all of the others, sending forward 34,312,880 tons, and the total for the Minnesota ranges was 37,443,028 tons. The Oliver Iron Mining Co. continues as the heaviest shipper.

Consolidated Arizona Receiver Appointed

Court Names G. M. Colvocoresses, Manager of Smelting Co.—Liabilities Over Half Million

By Wire.

G. M. Colvocoresses, general manager of the Consolidated Arizona Smelting Co. at Humboldt, Ariz., was appointed receiver for the company on Dec. 28 by the Federal District Court at Tucson. This action resulted from a petition made by F. S. Viele, of Prescott, stating that the corporation is indebted to the Prescott State Bank in the sum of $25,000 and has other obligations aggregating $500,000. One hundred and twenty destitute Mexican employees of the company at Swansea, where it was operating the Swansea Lease, have appealed to Governor Campbell for relief.

Colorado Mining Men to Convene in Denver

The annual meeting of the Colorado Metal Mining Association and the Colorado Chapter of the American Mining Congress will be held in Denver, Jan. 3, 4 and 5, 1921. Representative producers will confer with the chief officers of the railroads, smelters, and power and supply companies, to consider the problems affecting the related industries, and to determine how co-operative effort can advance the interests of all.

Oil shale men will strive to secure the most favorable location of an oil shale testing plant to be considered by the Government during the coming year. They will also formulate amendments to the placer laws regarding assessment work on oil shale locations.

Employers of labor will confer on labor and employment problems, with a view to the orderly liquidation of labor, and readjustment of wage schedules to meet changing industrial conditions.

Other subjects to come up for consideration will be proposed taxation laws, "blue sky" laws, state assistance to the U. S. Bureau of Mines for investigation of complex and low-grade ore problems, and other measures which may contribute towards the rehabilitation of the mining industry, which is admittedly in a discouraging condition.

New Railroad To Parallel Mexican Border

Material has arrived at Douglas, Ariz., for construction of a railroad in Mexico backed by the Mexican Government, that will parallel the border line and obviate the present necessity for entrance into the United States for passenger or freight traffic. The line will connect, south of Naco, with the Cananea-Nogales R.R. and will be built eastward from Agua Prieta to a connection with the Sierra Madre line in Chihuahua. It is being built especially for military needs and internal development, but is expected to be of large value to the mining interests of northern Mexico.

Plan To Remodel Mason Valley Smelter

I. C. C. Grants Increased Freight Rate —Company Will Await Ratification

Officers of the Mason Valley Copper Co. have announced that their smelter at Wabuska, Nev., will be remodeled and the blast furnaces replaced by a double-unit reverberatory plant. Application to the Interstate Commerce Commission for a reduction in freight rates on ore from copper mining centres in Plumas County, Cal., to Wabuska, led to a hearing, and the Commission's examiner has granted a reduction from $8 to $3.53 per ton, 3c. above the rate asked by the company. The carriers still have power to appeal to the Commission against adoption of the new rate, and the company will take no steps toward remodeling its plant until the time for appeal has expired or the rate is ratified.

The Mason Valley company has developed a large tonnage of copper ore in a property held under option in Plumas County, and two other mines, the Engels and Walker mines, the latter owned by the Anaconda Copper Co., produce large quantities of smelting ore and copper concentrates.

Lands Under Water Yield State of Utah Income

The State of Utah for the two years just ended has received $800,000 in interest on state land grant funds, this being $100,000 in excess of the amount received for the two-year period immediately preceding. Owing to the search for asphaltic deposits, and the reclamation of salt and potash from the waters of Great Salt Lake, the state has been receiving some income from an unusual source, namely, from lands under these waters.

Utah Salduro's Application a Record Breaker

The application of the Utah Salduro Co. for 1,543 potash claims in the Great Salt Lake desert in western Tooele County, Utah, upon which patent had already been granted and paid for, is of interest as being the largest single mineral application ever made in the history of the land office, according to U. S. Land Commissioner Clay Tallman. The claims cover twenty acres each, and amount in all to 30,654 acres. The claims are placer, and instead of being grouped in associations of eight or 160 acres, as could have been done, the company has preferred to do its assessment work on each claim singly to the amount of $500, making a total of $771,500 spent on the group, so that there should be no possible question as to title. The company, which has done extensive trenching and other work on the property, has far exceeded the sum above given; and has one of the largest potash plants in the world. Patents were granted May 24, 1920, application having been made in October, 1919.

Court Decision in Utah Power Case Awaited

Argument Concluded on Appeal from Ruling of Utilities Commission Allowing Increased Rates

Arguments on the appeals of holders of special contracts with the Utah Power & Light Co. made before the Utah supreme court were concluded Dec. 22. These appeals dealt with the recent ruling of the state public utilities commission allowing increased power rates above those fixed by contract. The increase allowed by the commission would bring in about $1,000,000 yearly to the power company, but in making the allowance of higher rates it was stipulated that the power company refrain from distributing any of the added income, pending the court's decision.

These contracts were entered into a number of years before the creation of the public utilities commission, and the protestants, among them the Utah Copper and other mining companies, hold that the contracts having been entirely legal when drawn up can not be abrogated without doing violence to State and Federal constitutions. The decision will be awaited with much interest by mining men, as it is felt that increased power rates will bear heavily on the industry.

Mining in the Ray District in 1920

BY A. L. FLAGG

The close of 1920 finds the conditions in the Ray district of Arizona in common with other copper mining sections, far from normal. The steady decline in the market for copper has resulted in a gradual but steady reduction of forces and operations to a minimum. Practically no new development is in progress at the end of the year. The decline in price of other metals has not been without its results, though the number of properties affected has not been large.

The Ray Consolidated has been operating steadily throughout the year but with a greatly reduced force. At the concentrator in Hayden corresponding reductions have been made. Practically no new development has been done at the mine and little or no improvements have been made at the mill.

Early in the year the Arizona Hercules suspended operations altogether and the company's property is now idle except for underground pumping.

In the Ray camp proper none of the smaller companies are operating except the Ray Lead Development Co., owning the Hailey-Soufferin lead mine, which has a small force at work and has made one shipment. Farther east some work was done on the Azurite group, belonging to Malloy interests at Globe, but unfavorable business conditions brought that to a close in July. In the early fall preparations were made to do some exploratory work on the Alma and Bob Tail groups, which lie to the south of Ray. Up to the present time the work has not been begun.

Southwest of Ray in the Copper Butte district important changes are taking place. The property formerly owned by the Copper Butte Mines Co. has been acquired by the American Ore Corporation, of Minneapolis, Minn. During the years 1916-17-18 the Copper Butte Mines produced steadily under lease to the Arizona Hercules interests. Daily shipments to the Hayden smelter reached a maximum of over 600 tons. During the past year the new owners have made a careful study of the property, added more ground to the original holdings and mapped out an extensive development program. Active operations will be begun early in 1921. The June Bug tunnel and the Roberts shaft will both be used and some drilling will be done.

The Ray Boston Copper Co., operating the old Kelvin Sultana properties, has been prospecting most of the year with diamond drills. To the south in the Ripsey district the Ray Verde Copper Co. has been developing the Tillman property, employing a considerable force.

In the vicinity of Troy the most extensive operations have been those of the Dripping Springs Copper Co. in continuation of the development work laid out and begun two years ago. Some ore has been shipped. The Cutler-Biwater vanadium property has been operated by Ben S. Wilson under lease. A small mill was installed and some vanadium concentrates were shipped. The Gila Development Co.'s mill at Kane Springs was forced to close early in the year because of increased operating costs and water problems.

Only one new mill was built during 1920; namely, that of the White Metals Mining Co. at Pioneer. Late in the year Kennard & Bierce, of Los Angeles, completed the 75-ton flotation plant. From the operations of this plant a car of lead-silver concentrates has been shipped. Some high-grade crude ore was also shipped.

In the past Pinal County has not produced much lead. This year the Continental Commission Co., operating the 79 mine, has shipped over seventy cars of lead-silver ores. The company has done a large amount of development besides building some very expensive roads. A large tonnage of milling ore has been developed which the company has been testing with a view to installing a mill when conditions warrant.

Silver ores have caused a renewal of interest in the Saddle Mountain district south of Christmas, where little work has been done in recent years. The Little Treasure property, from which some high-grade silver ores have been shipped at times, was reported sold to a Washington syndicate. Farther south on Deer Creek lessees have made shipments from the Shepherd-Whiteman property. Other attempts at development were made in the district but only on a small scale.

There have been no changes in the wage scales throughout the year and the district has been undisturbed by labor discussions. Labor has been plentiful at all times and during the latter half of the year has gradually reached the point where there is some unemployment.

The uncertainty about the proposal to suspend annual labor requirements for the year 1920 has caused considerable anxiety among the small claim owners. In many instances claim owners have gone ahead with the required work while others are holding off in hope of obtaining further relief.

State-Owned Cement Plant for South Dakota

According to members of the South Dakota Cement Commission the first state-owned cement plant will be located at Rapid City, S. D. The commission has made a final survey of the site and taken options on tracts of land adjoining the property of the Black Hills Rock Products Co. as well as on 340 acres of shale, lime and gypsum lands and all the machinery for the proposed plant which was purchased by the B. H. R. P. Co. during the last year.

The matter of establishing a state cement plant was voted upon two years ago and since then the commission has investigated a good many sites and has finally decided to locate the first plant at the place named. The capacity of the first unit will not be large enough to handle the cement demands of the entire state, but as the practicability of the plant is thoroughly demonstrated, the facilities will be enlarged. It is also proposed to establish plants in other parts of the state as soon as the first unit is tried out.

Recent Production Reports

Granby Cons. M. S. & P. Co. produced 2,465,585 lb. copper in November against 2,293,500 in October.

NEWS FROM WASHINGTON

By PAUL WOOTON
Special Correspondent

Assessment Work Bill Awaiting President's Signature

Passed by Both Houses, Must Be Signed Before Year Ends—Period of Grace Not To Be Increased

Dec. 29—Although much discussion was aroused in the House of Representatives over the extension of the time for doing the 1920 assessment work on mining claims, it was occasioned largely because some of the members recalled that statements had been made last year that no further concessions of that character would be asked. When the question was put, on the final passage of the bill, extending the time to July 1, there was no vote against it. Some of the members explained that it was their idea last year to promise only that the request was not to be a continuing annual affair. There was much testimony on the part of members that there is greater need this year to excuse the assessment obligations entirely than was the case last year. This was based on the very low price of metals, the financial stringency and the difficulty in securing the necessary labor. It was very evident from the discussion that many members hope to be able to secure the suspension altogether of the 1920 assessment work. This could be done if a bill to that effect were passed before July 1. It is doubtful, however, if the Senate would agree to such a measure.

Representative Rhodes, the chairman of the Committee on Mines and Mining of the House, declared, in the course of the debate, that mining conditions throughout the United States have not been, for twenty-five years, in the plight they are today. He instanced the alarming decrease in gold production and the disastrous drop in the prices of all other metals.

Representative Vaile, of Colorado, pointed out that, while there is unemployment in some industrial centers, the same condition does not prevail in the mining sections. He also called attention to the fact that, due to the suspension of assessment work for 1917, 1918 and 1919, most of the men accustomed to earn their livelihood by this type of work had gone into other lines, and are not available now for this employment. He also said that the hand-drilling miner is about to become extinct. With the introduction of air drills and electric power, the need for old style, single-jack miners, he declared, has reached small proportions. Since it is that type of miner that is required for annual assessment work, he asserted that it is becoming increasingly difficult to get this kind of work performed. In addition, Mr. Vaile said:

"The mining industry literally is shot to pieces. The price of gold, as measured by its purchasing power, is away down. Practically all minerals bring the miner less than the cost of production. Costs of machinery, power, fuel

and all supplies have not shared, to any appreciable extent, the supposed general fall of prices. Smelting charges are very high. Transportation charges have increased. Many railroad spurs and branches in mining regions have been discontinued.

"You can close a woolen mill temporarily with no great physical deterioration. The farmer, of course, derives very small comfort from the fact that his land is unimpaired even if he must sell his products at a loss, but the mine owner who is obliged to stop business would consider himself fortunate indeed if he had such a large part of the value of his property left. When a developed mine stops operating, it fills with water. Timbers rot. Earth and rock cave in. The fear of this almost total loss causes many mine owners to incur annual losses by continuing operations, even with no hope of present profit.

"May we not rely in some small degree on this great government to encourage the mining industry? Other proposals for remedial legislation will be presented to Congress. We shall ask for relief by tariff legislation, by the McFadden gold bonus bill and by other measures for this industry which has suffered more from war and war prices than has any other."

Representative Evans, of Nevada, added this thought to the discussion: "The excess profits tax, which adds a serious burden to mining, has done its full share to retard the opening of new properties and the continuation of old ones. The products of mining are in no sense an excess profit. They clearly are depletions of mine values and reserves."

In regard to securing further extension or suspension of the 1920 assessment work, Representative Wingo, the ranking minority member of the committee, said: "This should be stressed. Members from mining districts should impress upon their constituents the fact that this work must be done by July 1, as they will get no further extension from Congress. I am in favor of extending further time, but I know enough about the situation to say that this is the only bill that can be put through. I do not believe conditions will arise which will make it possible to secure further extensions and I think members should advise their constituents that they must do their assessment work by July 1, or lose their claims."

Bureau Officials Visit District of New Southern Station

Non-Metallic Survey To Be Made To Aid in Determining Problems for Study

While the principal work at the new southern experiment station of the U. S. Bureau of Mines will deal with the problems relating to iron and steel and by-product coke, attention is to be given to some of the more pressing problems in the mining of non-metals. These include the utilization of the so-called flint clays and the concentration of graphitic materials. A general survey is to be made of the non-metallics in the whole region tributary to the station so as to determine which of the important problems are to be undertaken first. After a visit to Tuscaloosa and Birmingham, Dr. F. G. Cottrell, the director of the Bureau of Mines, and Dorsey A. Lyon, the supervisor of stations, agree that there is an unlimited field in the South for the Bureau's activities.

The visit of Dr. Cottrell and Dr. Lyon and the arrival of Dr. W. R. Crane to start the work of the station was the occasion for a number of enjoyable and informative gatherings. At a dinner given by the Chamber of Commerce of Tuscaloosa, the Bureau officials were given an opportunity to meet the members of the faculty of the University of Alabama and others interested in mining development in that territory. The officials also were guests of honor at similar gatherings at Birmingham and at Anniston. At the latter place, the party was the guest of the Southern Manganese Corporation. The plant of the company was inspected. It includes two electric furnaces which are operating on ferro-phosphorus. Phosphoric acid is a by-product. It is planned to produce ammonium phosphate and other phosphorous compounds by combining the phosphoric acid with the products made in by-product coke ovens. During his stay in the South, Dr. Cottrell addressed the Alabama Technical Association.

House Mining Committee's Assistants

The Committee on Mines and Mining of the House of Representatives, under Representative Rhodes, its new chairman, is to have the advantage of the services of two assistants who are familiar with mining operations, through having been reared in mining communities. The new clerk of the committee is Miss Addie A. Hughes, of Bismarck, Mo. The committee will also be assisted by Theodore Ziske, Mr. Rhodes' private secretary, whose home is in Horine, Mo.

The total of silver purchases, under the Pittman Act, was 29,485,647 fine ounces at the close of business Dec. 24.

NEWS BY MINING DISTRICTS

Special London Letter

Gold Situation Steadily Worsening—Rand Output Continues To Fall—F. M. S. Fixes Minimum Tin Price

By W. A. DOMAN

London, Dec. 14—The gold party admit that there is pressing need for more gold; and yet circumstances concerning its getting are decidedly adverse. Though the Witwatersrand maintains its position as the premier gold mining district of the world the quantity of the metal produced monthly is gradually on the decline. Occasionally there is a spurt, but something seems to happen, either in a technical sense, or in connection with labor, that prevents it from being continued. For last month the output of the mines of the Transvaal was only 633,737 oz., or 44,000 oz. less than twelve months ago, and the aggregate for the eleven months of the year to date is 158,490 oz. less at 7,521,410 oz.

Although the estimated selling price is taken at the same figure as for October, i. e., £5 17s. 6d. per oz. fine, the gross value is only £3,723,000. Investors have lost that robust faith in the share market that they once had; they are, however, eagerly looking forward to the half year's dividend announcements. Returns upon capital form the true test from the standpoint of the public, but it cannot be denied that the gold premium obscures the position. Dividends are not now necessarily a reflection of economy in mining; they are derived largely from extraneous incomings. Only the Barnato group of companies has up to the present declared its results, and generally speaking they are satisfactory. Van Ryn Deep shareholders receive 13s. per share for the year as against 9s. 6d. in 1919; Government Gold Mining Areas raises its distribution for the twelve months from 7s. 6d. to 10s., and Witwatersrand Gold doubles the last year's 2s. Larger dividends are also expected from other groups, but the public remains unmoved. To some extent this may be the result of the general trend of prices, for in every market selling preponderates.

Among the Far Eastern Rand Mines the Geduld Proprietary seems to be opening up in a remarkably satisfactory manner, and recent developments are said to have given it an extra profit value of approximately £2,000,000. The Geduld, by the way, was President Kruger's farm.

Globe & Phoenix developments to which I have referred on previous occasions continue most encouraging especially in depth. On No. 14 level 13 ft. average 64 dwt.; on No. 15 level 26

ft. driven average 125 dwt.; on No. 18 level 13 ft. driven show 121 dwt., and less startling, though still good, values are obtained elsewhere. For November 5,759 tons treated yielded 7,875 oz. giving a profit of £17,987 with gold at 84s. an oz., and the present price is nearer 119s.

In regard to the efforts to stabilize tin, it is interesting to mention that the Federated Malay States has fixed, temporarily at least, the minimum price for Straits refined at $110 a picul. This is a start, but how it will work out remains to be seen. Even governments cannot overthrow the operation of economic laws.

Ever rising working costs have necessitated the rejection for the present, by the directors of the Tomboy mine, of a large quantity of ore previously included in the reserves. A cut from 888,244 tons to 500,000 is pretty drastic. Similar action is being taken in other directions.

CANADA

Ontario

To Defer Sick Benefit Scheme at Cobalt—Hollinger Treating Larger Tonnage

Cobalt—It has been decided to hold the proposed sick benefit scheme in abeyance for a time owing to the uncertain conditions now prevailing. It is thought that if the fund were put into operation at present the comparatively small number of men now employed would not provide sufficient funds to demonstrate the feasibility of the scheme. The organization will be known as "The Cobalt Mines, Mills & Power Co.'s Employees Sick Benefit Fund."

A new company, entitled the Ruby Co-operative Cobalt Mines, Ltd., has been organized with a capitalization of $1,500,000 to take over and operate the Ruby mine in Bucke Township. Clifford H. Moore, of Cobalt, is president.

Porcupine—Owing to the use of its auxiliary equipment the Hollinger Consolidated has latterly been able considerably to increase the tonnage of ore treated, as high as 2,400 tons having been handled in 24 hours, as compared with the daily average of between 1,700 and 1,800 tons in November.

The annual report of the Keora Porcupine shows that the outcropping vein had been proved up by diamond drilling to the depth of 1,000 ft., the gold content at that depth confirming the value of $6 obtained from surface sampling. In addition 2,000 ft. of diamond drilling has resulted in important discoveries.

Kirkland Lake—The Lake Shore during November treated 1,810 tons of ore with a recovery of $49,339, being an average of $27.25 per ton. The shaft had reached a depth of 564 ft. at the end of November.

Mining operations at the Teck Hughes have been suspended for a week owing to a broken hoist.

British Columbia

Trail—Shipments received at the Consolidated smelter during the week ended Dec. 14 totaled 9,093 tons. Shippers were as follows:

Mine	Location	Wet Tons
Bluebell,	Riondel	222
Canada Copper,	Allenby	30
Florence,	Princess Creek	172
Josie,	Rossland	285
Knob Hill,	Republic	53
North Star,	Kimberley	165
Silver Bear,	Zwicky	21
Society Girl,	Moyie	19
Company Mines		8,126

ARIZONA

Arizona Commercial Cuts Black Hawk Vein

Douglas—The order of the Mexican government lifting export duties from ores and copper is retroactive to Dec. 1, according to advices received at Agua Prieta by Antonio G. Rivera, chief of the customs service at that point. The export duty is not to be restored as long as copper remains below 15c.

A fire in the change room of the Copper Queen smelter at Douglas did $2,000 damage recently, the destruction embracing a wooden structure and much clothing, the property of the employees.

Clifton—The property of the Sierra de Oro Mining Co. on the San Francisco River, above Clifton, has been sold under execution to Dell M. Potter, of Clifton, owner of the adjoining Consolation mines. His bid was $22,338 and costs.

Jerome—Since Dec. 13 Jerome-Superior has been idle and has filled with water to the 700 level. Most of the stock is held in Los Angeles, where, on Nov. 24, a meeting of insurgent stockholders was held that censured the management of George Mitchell as extravagant and that elected G. A. Kobold as president, L. J. Selby as secretary-treasurer, and James A. Brower, William Steel, Frank A. Flory, E. C. Joannes and Gussie Egelhoff-Rundell. Thereafter in Jerome was held a joint meeting of the factions. Of the outstanding 1,300,000 shares 1,161,479 were represented. The insurgents represented 620,495 shares but there was a split on the last day of the three-day quarrel, the Californians withdrawing, leaving the old management still in the saddle locally. This, it is claimed, left no quorum that could act with legality. Later, in Los Angeles, the old board, represented by Melville Fraser, G. D. Case and George Mitchell, claiming legally to be, respectively, president, secretary-treasurer and manager, entered suit to declare void all conclusions of the Nov. 24 meeting and to restrain the insurgents elected from assuming any title to the offices claimed. There also were made charges of conspiracy and the utterance of malicious and libelous statements concerning the old directors.

For the fourth time in as many years no quorum was mustered at the annual meeting here of the Green Monster Mining Co., which owns a very large expanse of undeveloped ground near Jerome. Nothing more than assessment work is being done.

Prescott—In the Yaeger Canyon mine of the Shannon Copper Co. development work on the 900 level is being pushed on a drift now 700 ft. long, following a good vein. A. L. Ferris is in charge.

United Arizona ground, south of Mayer, again is being diamond drilled, heavier equipment having been installed. The work under contract will continue about four months.

At the Union mine, W. H. F. Jones, in charge, states that a 50-ton reduction plant is to be purchased to replace a small plant that has not proved effective.

Phoenix—New hoisting equipment is being installed on the Ranier property, near Wenden. When this is finished the main shaft, No. 3, now 468 ft. deep, will be sunk to 800 ft. Good ore for shipment, is being taken from shaft 2.

New hoisting and compressor equipment is being planned by the Queen Creek Copper Co., of Superior, a corporation financed largely by Dundee-Arizona interests. Electric power has been contracted for to be delivered after March 1.

Globe—Arizona Commercial is reported to have cut the Black Hawk vein on the 400-ft. level and to have passed through the ore. This is said to be 10 ft. wide averaging 5½ per cent copper. It is said that this vein had not heretofore been considered to carry commercial ore in Arizona Commercial ground. The companies operations were recently suspended indefinitely.

The Continental Commission Co., operating the Seventy-nine mine near Winkelman, has shipped to El Paso 70 carloads of lead-silver ore. Lee Reagan, president of the corporation, states that the last carload netted $1,200.

COLORADO

Rich Ore Opened in Rose Nicol—U. S. Zinc Converting Smelter Into Oxide Plant

Cripple Creek—A promising orebody has been opened on the 10th level of the Rose Nicol property which is being developed by the Reva Gold Mining Co. Samples of high-grade ore assay over $1,000 a ton in gold, and about $10 in silver.

Magnolia—The shaft of the Senator Hill mine is being sunk from the 250 ft. to the 1,000-ft. level by the Utah Metals Co.

Ward—The Puzzler property has been leased to the Bond Syndicate Leasing Co., which has also remodeled the Strong mill to treat ores from mines and dump in the Ward district.

Pueblo—The United States Zinc Co. is converting its smelter into a zinc oxide plant. One unit has already been converted at an initial cost of $10,000.

If the experiment proves successful, the entire plant will be so converted.

Ouray—The Eurades company has cut its force by half because of the high cost of operating This property was being actively developed, though no ore was going to market A vein of considerable size was recently discovered and is being developed; this ore is expected to warrant the erection of a mill in the spring.

The Lundberg-Wilfley Lease at the Barstow has opened up a very good body of gold-bearing quartz associated with sulphide ore of milling grade. This ore is being stoped and further developed and will be milled in the spring. Practically all other lessees, except the Krisher lease on the Mountain Top and the Luna lease on the Wedge, have quit work, awaiting reasonable freight and treatment rates.

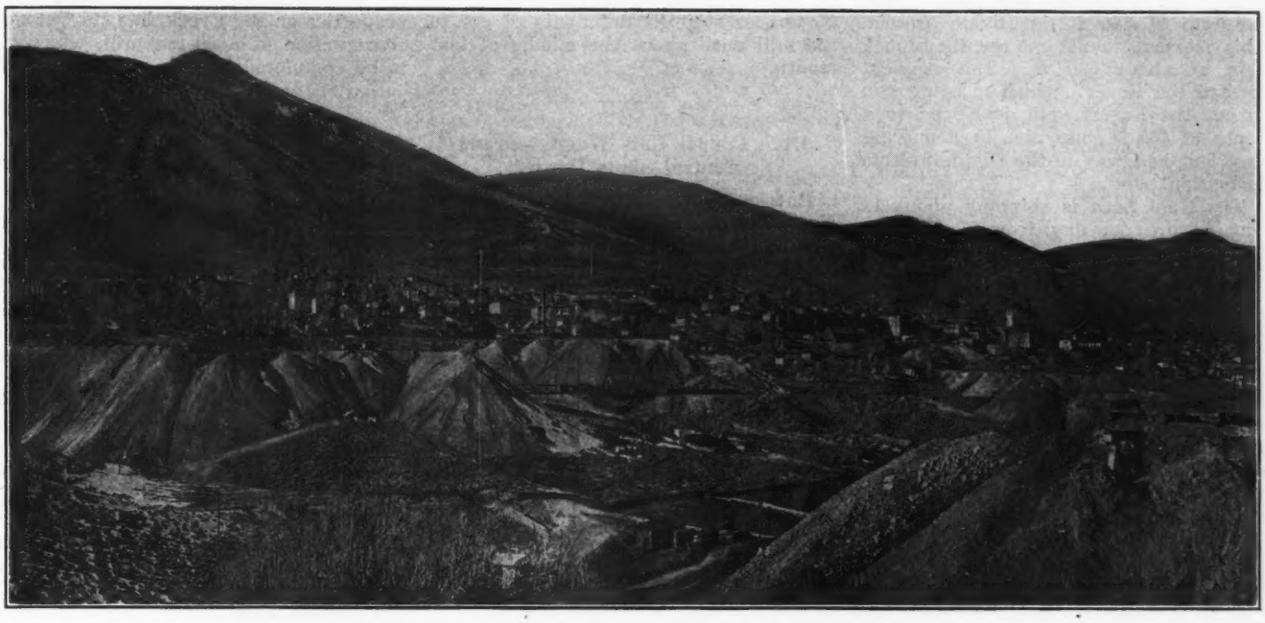
the extensive workings above that point and the fact that it was also necessary to unwater the adjoining Kennedy mine to a similar depth because of the two properties being connected. Upon reaching the 3,900 the fears of the management regarding caved ground were realized so some extent. At that point, the large electric hoist, a duplicate of the surface hoisting plant and the largest underground hoist on the Mother Lode, was stationed. This underground plant made possible the operations conducted successfully at greater depth. V. S. Barbarini, the newly appointed superintendent, is in charge.

San Francisco—James D. Colt, of Boston, has been appointed receiver for the New Idria Quicksilver Mining Co. This is the result of a friendly suit brought against the company, which is in financial difficulty.

a gold prospect 23 miles south of Goldfield and named by them the Gold Hill mine, but known as the Railroad Springs property. It has a wide vein showing some low-grade gold-copper ore. The Goldfield Cons. has resumed the practice of leasing on a low royalty basis.

Leadville—Fire damage in the main tunnel of the Leadville Mines Co. is being repaired, but some of the machinery must be replaced. Station sets were burned out and the blower and small hoist damaged.

Eureka—The Holly pilot mill will not be completed until spring, owing to delayed delivery of equipment, according to a recent announcement. Most of the smaller properties and prospects are closed for the winter.



OPERATIONS ON THE COMSTOCK LODE, VIRGINIA CITY, NEV.

CALIFORNIA

Bulkeley Wells Closes Deal for Fremont Consolidated—Argonaut Unwatered Below 3,900 Level

Sutter Creek—The Fremont Consolidated Mines in the Drytown mining district is to be given an opportunity to prove its value. The deal pending for its purchase by Bulkeley Wells has been closed and mining operations have already been started. This property lies a mile and a half north of Amador City, and comprises four mining claims, namely: the Gover, North Gover, Fremont and Loyal Lode, a length of over 4,000 ft. on the lode. It has been developed by two shafts, the Gover being 1,500 ft. deep and the Fremont about 3,000. These shafts are connected on the 1,500-ft. level. Edwin Higgins is general manager, and B. I. Hoxsie superintendent.

Jackson—The water in the Argonaut mine shaft has been lowered to a point below the 3,900-ft. level, which is considered very good headway considering

NEVADA

Goldfield Development Buys Railroad Springs Property—Repairing Fire Damage at Leadville

Virginia City—The number of miners employed in the Comstock district is increasing as old mines are reopened and new enterprises launched. The projected 10,000-ft. haulage tunnel of the United Comstock Mines Co. has advanced nearly 300 ft. from the portal, the compressor plant has been finished, the mill site is being prepared for construction and a spur track is being built from the Virginia & Truckee Railroad to the mill site.

Goldfield—The Goldfield Development Co. has relinquished to the Goldfield Consolidated Mines Co. its leases on the 1,000-ton mill and the mines of the latter company. The development company, financed by assessments on the stock, is said to have expended more than $325,000, including $42,000 for mill repairs. The officers have purchased with funds received from assessments

Tonopah—The latest bullion shipments reported from the mines of the Tonopah district are: Tonopah Belmont, $109,076; West End, $55,770, and Tonopah Extension, $57,000. This represents the clean-up for the latter half of November for these respective mines.

In the West End development work is being done on three veins, the West End, Ohio and Footwall veins, with no special changes. Work is being performed from the 300, 400, 500, 600 and 800 levels. Active work is being done from the Ohio shaft 800 level in Tonopah "76" ground. Formation is favorable with no discoveries as yet. West End tonnage to mill was about 1,500 tons and development totaled about 165 ft. for the past week.

Divide—Development, especially on the lower levels, continues favorable at the Tonopah Divide. On the 800 level, where the vein has been drifted on southeasterly for over 150 ft., the last 80 ft. of which averaged $35 per ton, crosscutting has been started to the

north and south. This oreshoot does not show on the 585 level, which is the next level above, and the management is very optimistic regarding territory to the southeast of the present face. On the 1,000 level no commercial ore has as yet been found, although values up to $6 per ton are common. The development on the 165 level failed to disclose anything new of importance. Daily shipments of about 50 tons of cre of good grade are being made to the Belmont mill at Tonopah.

The Tonopah Dividend has started a crosscut from the 400 level of the new shaft to cut a vein about 100 ft. distant. If this ledge shows no values when cut the company plans to resume work from the 850 level of the old shaft.

The Kernick Divide is making fair headway in its crosscutting work from the 900 level. The south crosscut toward the Hasbrouck has made a total progress of 150 ft. in Divide breccia. This crosscut should cut the Hasbrouck vein at about 600 ft. The crosscut toward the Revert, which is being run to cut the Revert vein developed to a depth of 400 ft., has also been making excellent headway in the Divide breccia formation.

The Gold Zone is shipping about 15 tons of ore per day from a stope on the 711 level. Limited development work is being done.

Manhattan—The West orebody, recently cut on the 500 level of the White Caps mine, has been proved to be 12 ft. wide for a distance of 41 ft. with ore in the face of the drift, and an average value of $23 per ton. The ore is stated to be highly siliceous and easily treated. Crosscutting has been started from the 300 and 800 levels in an effort to pick up the upward and downward continuation of this orebody. It is stated that if developments on these levels are at all favorable milling operations will be resumed.

MONTANA

Butte & Superior's Black Rock Mill Shuts Down—Tuolumne Deepening Main Range Shaft

Butte—Old fires which have been burning in the Anaconda mine for more than twenty years broke out the past week on the 6th, 7th and 8th levels, proving stubborn for a time. They were brought under control after several days of effort.

All operations have been suspended at the Black Rock concentrator of the Butte & Superior and only development work is being done in the mine at the present time.

Operations at the East Butte mine and smelter will continue until the copper situation becomes such that the metal is unsalable when operation will be suspended, according to a statement made by Oscar Rohn, general manager. About 300 tons of ore is being hoisted daily, averaging more than 5 per cent. The East Butte employs a system of underground sorting which is proving very economical.

Sinking of the Main Range shaft of the Tuolumne Copper Co. from the 1,200-ft. level was started last week with the 2,000-ft. level as objective. The shaft is being carried down with two main working compartments and a manway. On the 1,200-ft. level the Tuolumne has a zone 50 ft. wide well seamed and streaked with fine veinlets of ore through a manganese gangue, and it is the belief of the Tuolumne's engineers that this body with depth affords a good chance of becoming commercial ore. In addition to this body the ore deposit on the 1,200 ranged in width from 8 to 20 ft.

Bullion production of the Barnes-King Development Co. for November was $22,602.97 from the Shannon mine and $2,400 from lessees who are operating the North Moccasin property. Shannon tonnage was 2,309 averaging $9.80 per ton. Breakage of the gears of the Shannon rope tramway in November stopped shipments of ore to the mill until about the middle of last month.

UTAH

Utah Copper Cuts Wages—Grand Central Shuts Down

Eureka—Shipments from the Tintic district for the week ended Dec. 18 totaled 180 cars as against 179 the week before. Work has been started by the Tintic Standard on a third shaft, to have four compartments. It will be 6 x 18 ft.

Mammoth—The Grand Central, which recently has been shipping at the rate of about a car of ore daily, has closed down, owing to unfavorable metal prices and heavy costs, which prevent profitable operation.

Salt Lake City—The Utah Copper Co. has posted an announcement of a wage reduction of $1 a day for skilled labor and 85c. for unskilled labor, effective Jan. 1.

Park City—Shipments for the week ended Dec. 18 amounted to 1,908 tons.

The 225-ton mill of the Glen-Allen is being warmed up and will begin operations, it is stated, at the rate of 100 tons a day. The foundations are finished for the flotation plant, which is to consist of five Jones-Belmont machines, and within a month or six weeks it is expected that it will be put in operation.

IDAHO

Cœur d'Alene District Planning Railroad Extension Up Pine Creek

Pine Creek—An engineer of the O.-W. R. & N. Co. recently visited the right of way for the proposed extension of the Pine Creek branch and is quoted as saying that the railroad company had entered into an agreement with the Milwaukee Lumber Co. to extend the branch to the forks of the creek, about three miles from the end of the present two miles of track, and thence up the west fork four miles to the timber holdings of the lumber company, the Milwaukee company having guaranteed a certain tonnage.

Mullan—The Midnight Mining Co. is driving a raise from its north drift to the surface, a distance of 1,100 ft. The first 200 ft. is on the vein and from that point it is being extended vertically, the total distance now accomplished being 400 ft. In the 280-ft. drift there is considerable lead-silver ore also in the raise. Crosscuts will be run to the vein every 100 ft. The Midnight is controlled by Jones & Baker, of New York.

The Gold Hunter Mining & Smelting Co. has taken a bond and lease on the Paymaster group of three claims, which joins the Hunter on the west. The Paymaster is owned by the estate of the late Thomas L. Greenough.

Big Creek—The Sunshine Mining Co., which owns what was formerly known as the Yankee Boy and Yankee Girl properties on Big Creek, has started the construction of a 50-ton mill, which is to be completed in about three months.

MINNESOTA

Mesabi Range

Minnesota Steel Co.'s Plant Ready Next Fall

Hibbing—The Mahoning Ore & Steel Co. has decided to reconsider its decision to erect twenty new dwellings at its Mahoning Location until a later date. The contract was to be let this past week but due to the weather and market conditions the company has decided that the existing conditions warrant a delay of several months. The company has already greatly improved its present houses by the addition of bathrooms and basements.

In the general uncertainty in the steel trade, it is generally believed in the Lake Superior district that ore quotations for 1921 will not be fixed for several weeks.

Duluth—It is contemplated that the completion of the Minnesota Steel Co.'s plant at Duluth will be accomplished by next fall as orders have been received from the headquarters of the United States Steel Corporation to rush the new construction work. These orders are relative to the wire, nail and sheet mills and it is rumored that a plate mill of sufficient capacity to meet the requirements of the Northwest in this product will also be included in the construction program and orders to this effect are expected in the near future. Work has also been started upon the erection of an addition to the hot-bed building and upon the extension to the power plant building. The present force employed by the steel company's plant in its operating departments and in the new construction work is close to 3,200 men. This is the largest number of men that has been employed by the company and the contractors for over three years. With the completion of the new departments, a force of approximately 4,500 men will be employed in the regular operation of the plant.

THE MARKET REPORT

Daily Prices of Metals

Dec.	Copper, N. Y. net refinery*	Tin		Lead		Zinc
	Electrolytic	99 Per Cent	Straits	N. Y.	St. L.	St. L.
23	12.75@13.00	29.50	32.50@33.00	4.50@4.75	4.50@4.65	5.70
24	12.75	29.00	32.75@33.00	4.50@4.75	4.50@4.65	5.60
25	.....	.....	.....	.....	.....	.....
27	12.75	29.00	32.75@33.00	4.50@4.75	4.50@4.65	5.50@5.60
28	12.50@12.75	29.50	33.00@33.50	4.50@4.75	4.50@4.65	5.65
29	12.50@12.75	30.00	33.50@34.00	4.50@4.75	4.50@4.65	5.70

*These prices correspond to the following quotations for copper, "delivered": 13 @13.25, 13, 13, 12.75@13, and 12.75@13c.

The above quotations are our appraisal of the average of the major markets based generally on sales as made and reported by producers and agencies, and represent to the best of our judgment the prevailing values of the metals for deliveries constituting the major markets, reduced to the basis of New York, cash, except where St. Louis is the normal basing point, or as otherwise noted. All prices are in cents per pound. Copper is commonly sold "delivered," which means that the seller pays the freight from the refinery to the buyer's destination.

Quotations for copper are for ordinary forms of wire bars, ingot bars and cakes. For ingots an extra of 0.05c. per lb. is charged and there are other extras for other shapes. Cathodes are sold at a discount of 0.125c. per lb.

Quotations for zinc are for ordinary Prime Western brands. Tin is quoted on the basis of spot American tin, 99 per cent grade, and spot Straits tin.

London

Dec.	Copper			Tin		Lead		Zinc	
	Standard		Electrolytic						
	Spot	3 M		Spot	3 M	Spot	3 M	Spot	3 M
23	72¼	73	82	201	205	21½	22¾	22½	24⅝
24	....	....	...	....	....	...	...	...	...
25	..	.						...	
27	....	....	...	....	....	...	...	...	...
28	71	73	82	200	205¾	21½	22¾	24	26
29	70½	72¼	82	200	206	22	23½	26	28

The above table gives the closing quotations on the London Metal Exchange. All prices in pounds sterling per ton of 2,240 lb.

Silver and Sterling Exchange

Dec.	Sterling Exchange	Silver			Dec.	Sterling Exchange	Silver		
		New York, Domestic Origin	New York, Foreign Origin	London			New York, Domestic Origin	New York, Foreign Origin	London
23	352½	99½	63½	40⅝	27	351	99½	64¼	Holiday
24	351	99½	65⅜	42	28	349⅛	99½	65	42
25	....	...	...	...	29	349½	99½	66⅝	43

New York quotations are as reported by Handy & Harman and are in cents per troy ounce of bar silver, 999 fine. London quotations are in pence per troy ounce of sterling silver, 925 fine.

Metal Markets

New York, Dec. 29, 1920

The metal market was as dull as usual during the last week, and in general no interest was taken by either buyers or sellers. It is fashionable to lay the quietness to the holidays, and this excuse may be offered for variety. Consumers are not disposed to buy raw materials until demand for their products improves, being willing to take a chance on prices at that indefinite time. The London market was closed on Friday, the 24th, and Monday, the 27th, as well as on Christmas. When trading was resumed on Tuesday, prices held steady, with a marked advance in zinc, followed by another today.

Copper

The large producers report no business at their holding price of 14c. delivered, but feel that a reduction at this time would avail nothing, for smaller interests would cut still lower, and consumers, expecting further reductions, would continue to buy only for immediate needs. The small quantity of copper needed to supply the present demand can be obtained for 12.75c. delivered, for spot metal, and 13.25c. for delivery as late as the second quarter. Some small lots have been sold to both domestic and foreign consumers at these prices, but it is unlikely that any large amounts could be secured except at an advance. At auction on the N. Y. Metal Exchange yesterday, a 50-ton lot brought only 12.35c. We understand that no change in price policy is contemplated in marketing the porphyry output under the arrangements mentioned last week.

Lead

The A. S. & R. official price remains at 4.75c. New York and St. Louis.

Reports in the press continue to give lead prices as low as 4.45c. New York and St. Louis, but we are unable to confirm them, and sales even at 4.50c. are insignificant. This price is asked by one interest for spot metal, for which there is no demand. Metal for delivery as late as May has been sold for 4.75c., and one large lot (for these times) of a favorite brand was sold for January shipment at 5c. New York. The market may be said to be steady at the present prices, with a disposition to ask a slightly increasing premium for futures.

Preliminary production figures which we have compiled indicate that the United States production for 1920 will be slightly greater than that for 1919.

Zinc

With London stronger since the holiday, domestic prices have shown an upward trend after the depression of last week, which was due to threatened imports. Under present conditions the European price dominates the market. Before the advance in London, zinc from Europe for future delivery was offered in Baltimore by brokers as low as 5.45c. The amount of business done was small, however, and at the same time better prices could be secured for known domestic brands. Production continues to be curtailed, owing entirely to the fact that demand is very poor and not to any desire to stop production temporarily in order to establish a new and lower wage scale. Most of the local mushroom concerns which were established during the last two years to trade in zinc have been put out of business by the recent depression.

Tin

The tin market was hardly active enough to establish quotations, especially on Friday and Monday, when, with London closed, sellers were totally at sea. It is fortunate that this condition does not happen often, and it must have been a relief to local sellers to have the Tuesday cables show a slight advance. The price of 99 per cent tin declined slightly on Friday in the face of a rise in Straits, owing to a little competition from Chinese tin.

Straits tin for future delivery: Dec. 23d, 33.50@34c.; 24th, 33.50@34c.; 27th, 33.50@34c.; 28th, 33.75@34c.; 29th, 34.50@35c.

Arrivals of tin in long tons: Dec. 22d, Straits, 35; 27th, London, 50.

Silver

For the last week the market has been very quiet, due to the holiday season, and this condition will probably continue into the new year. Prices have improved during this period despite small business, and today's London price of 43d. is the highest quotation since Dec. 8. Buying for China account is reported as responsible for the rise.

Mexican Dollars—Dec. 23d, 48½; 24th, 49⅝; 27th, 48½; 28th, 49¼; 29th, 50.

Gold

Gold in London: Dec. 23d, 115s. 8d.; 24th, 116s. 1d.; 28th, 116s. 10d.; 29th, 116s. 9d.

General stock of money in the United States, Dec. 1: Gold coin (including bullion in Treasury), $2,761,338,519; standard silver dollars, $269,857,494; subsidiary silver, $266,609,065; United States notes, $346,681,016; Federal Reserve notes, $3,663,592,795; Federal Reserve Bank notes, $239,569,800; National Bank notes, $74,010,797; total, $8,281,659,486. The principal change from Nov. 1 was in gold coin, which increased $22,294,953.

Foreign Exchange

Only slight changes have occurred in the value of foreign money during the last week, and the market has been featureless. On Tuesday, Dec. 28, francs were 5.81c.; lire, 3.34., (a new low); and marks, 1.355c. New York funds in Montreal declined from the recent high to 16½ per cent premium. The present rates are causing grave concern to Canadian importers. The balance of trade is only a little more against that country than normally, but the state of sterling exchange makes it impossible to clear unfavorable balances through London, as was done before the war. Until sterling increases in value or Canadian exports to this country more nearly balance imports, the premium on American funds is likely to continue upward. Increased shipments of gold are said to be unlikely.

Other Metals

Aluminum—List prices of 28.3@28.5c. are purely nominal. Metal may be had at 22@25c. per lb.

Antimony — Chinese and Japanese brands, 5¼@5⅜c.; market quiet. W.C.C. brand, 6¼@6½c. per lb. Cookson's "C" grade, 9½c. Chinese needle antimony, lump, nominal at 4½c. per lb. Standard powdered needle antimony[1] (200 mesh), 7@7½c. per lb.

White antimony oxide, Chinese, guaranteed 99 per cent Sb_2O_3, wholesale lots, 7c.

Bismuth—$2.40 per lb., 500-lb. lots, and $2.42 per lb., 100-lb. lots.

Cadmium—Nominal, $1.40 per lb.

Cobalt—Metal, $6 per lb.; black oxide, $4.10 per lb.; sulphate, $1.60.

Iridium—Nominal, $325 per oz.

Magnesium — Crude, 99 per cent, $1.35 per lb. f.o.b. Philadelphia.

[1]**Molybdenum Metal** in rod or wire form, 99.9 per cent pure, $32@$40 per lb., according to gage.

Nickel—Ingot, 43c.; shot, 43c.; electrolytic, 45c., f.o.b. Bayonne, N. J.

Monel Metal—Shot, 35c.; blocks, 35c., and ingots, 38c. per lb., f.o.b. Bayonne.

Osmium—Open market, $70@$80 per troy oz.

Palladium—$75 per oz.

Platinum—Firm at $75 per oz.

Quicksilver—Nominally $50 per 75-lb. flask, with second-hands selling as low as $47 per 75-lb. flask. San Francisco wires $47@$50. Dull.

[1]**Rhodium**—$200@$225 per troy oz.

Ruthenium—$175@$200 per troy oz.

[1]**Selenium**—Black powdered, amorphous, 99.5 per cent pure, $2@$2.25 per lb.

[1]**Thallium Metal**—Ingot, 99 per cent pure, $20 per lb.

[1]**Tungsten Metal**—Wire, $35@$60 per kilogram, according to purity and gage.

Metallic Ores

Chrome Ore—Guaranteed 50 per cent Cr_2O_3 foreign ore with a maximum of 6 per cent silica, 55@60c. per unit, New York. California concentrates, 50 per cent Cr_2O_3 and upward, 60@65c.

[1]**Manganese Ore**—40@45c. per unit, seaport; chemical ore (MnO_2) $60@$65 per gross ton, lump; $75@$80 per net ton, powdered.

Molybdenum Ore—85 per cent MoS_2, 55@60c. per lb of contained sulphide, New York.

[1]**Tantalum Ore**—Guaranteed minimum 60 per cent tantalic acid, 40c. per lb. in ton lots.

[1]**Titanium Ores**—Ilmenite, 52 per cent TiO_2, 1½@2c. per lb. for ore. Rutile, 95 per cent TiO_2, 12c. per lb. for ore, with concessions on large lots or contracts.

[1]**Tungsten Ore**—Scheelite, 60 per cent WO_3 and over, per unit of WO_3, $4@$4.50, f.o.b. mines; wolframite, 60 per cent WO_3 and over, per unit of WO_3, $3.50, in New York.

Uranium Ore (Carnotite)—Ore containing 1½ per cent U_3O_8 and 5 per cent V_2O_5 sells for $1.50 per lb. of U_3O_8 and 75c. per lb. of V_2O_5; ore containing 2 per cent U_3O_8 and 5 per cent V_2O_5 sells for $2.25 and 75c. per lb., respectively; higher U_3O_8 and V_2O_5 content commands proportionately higher prices.

Vanadium Ore—$1.50 per lb. of V_2O_5 (guaranteed minimum of 18 per cent V_2O_5), New York.

[1]**Zircon**—Washed, iron free, 5c. per lb.

[1]**Zirkite**—According to conditions, $70 @$90 per ton, carload lots. Pure white oxide, 99 per cent, is quoted at $1.15 per lb. in ton lots.

Zinc and Lead Ore Markets

Joplin, Mo., Dec. 24—Zinc blende, per ton, high, $36.10; basis 60 per cent zinc, premium, $32; Prime Western, $30; fines and slimes, $27.50@$25. Calamine, basis 40 per cent zinc, offerings $20; no sales. Average settling prices: Blende, $35; calamine, $28; all zinc ores, $33.88.

Lead, high, $57.90; basis 80 per cent lead, $55@$47.50; average settling price, all grades of lead, $53.75 per ton.

Shipments for the week: Blende, 10,471; calamine, 167; lead, 1,334 tons. Value, all ores the week, $442,250.

Purchases this week aggregated 1,900 tons, 600 tons on $32 and the balance on $30 basis.

A number of mines closed down last night, some to resume Monday and others will observe a week's holiday.

Platteville, Wis., Dec. 25—No zinc or lead ore market reported. Shipments are further curtailed. Shipments for the week: Blende, 165 tons. Shipments for the year: Blende, 60,506; calamine, 2,551; lead, 4,562, sulphur ore, 1,342 tons. Shipped during the week to separating plants 1,291 tons blende.

Non-Metallic Minerals

Asbestos—Crude, No. 1 $2,000@ $3,500; No. 2, $1,400@$2,000; spinning fibres, $400@$1,000; magnesia and compressed sheet fibres, $325@$500; shingle stock, $110@$150; paper stock, $60@ $75; cement stock, $17.50@$30; floats, $8.50@$15, all per short ton, f.o.b. Thetford, Broughton, and Black Lake mines, Quebec, Canada; 5 per cent to be added as export sales tax.

Barytes—Crude, 88 to 94 per cent barium content, $10@$12 per net ton; ground (white) $24@$30 in bags, carload lots; (off-color) $22@$26 in bags, carload lots; all f.o.b. Kings Creek, S. C. Crude, 88 to 94 per cent, $23; ground (white), $45; ground (off color) $30@$32 per net ton, less than carload lots, f.o.b. New York. Crude, first grade, $10 per ton, f.o.b. cars, Missouri; floated, $28 per ton in bbls.; $26.50 per ton in 100-lb. bags; extra charge for bags, f.o.b. St. Louis.

Chalk—English, extra light, 5@5½c.; light, 5@6c.; dense, 4½@5c. per lb., all f.o.b. New York.

China Clay (Kaolin)—Crude, $8@ $12; washed, $12@$15; powdered, $18@ $22; bags extra, per net ton, f.o.b. mines, Georgia; crude, $8@$12; ground, $15@$40, f.o.b. Virginia points. Domestic lump, $10@$20; powdered, $25@ $30; imported lump, $25@$35; powdered, $30@$35, f.o.b. New York.

Feldspar—Crude, $8@$14 per gross ton, f.o.b. Maryland and North Carolina points; $7.50@$10, f.o.b. Maine; ground, $27@$30, car lots, f.o.b. Baltimore; ground, $17@$21, f.o.b. North Carolina points; $17@$21 per ton, No. 1 ground, f.o.b. New York State; $21@ $23 per ton, ground, f.o.b. Maine.

Fluorspar — Gravel, guaranteed 85 per cent calcium fluoride and not over 6 per cent silica, $25 per ton, f.o.b. Illinois mines, and $25.50, f.o.b. Kentucky; ground, suitable for acid, chem-

[1]Furnished by Foote Mineral Co., Philadelphia, Pa.

ical or enameling purposes, $60; lump, $17.50, f.o.b. Tonuco, N. M. In Canada 85 per cent calcium fluoride sells for $20 per ton, f.o.b. Madoc; output limited. Canadian price generally $18 (Canadian currency) per ton, f.o.b. mines.

Fuller's Earth—$16 per ton, carload lots, f.o.b. New York.

Graphite—The 90 per cent crucible grade is held in Alabama for 9c. per lb. and 85 per cent grade, 7@9c. Lubricating grade commanding the best price is a fine flake, passing a 100@120 mesh, and running higher than 96 per cent carbon. Linotype machines use a flake passing 90 mesh and standing on a 120 screen, with 90 per cent carbon, retailing at 75c. to $1 per lb. and selling to jobbers at 11@40c.

Gypsum—Plaster of paris in carload lots sells for $4.25 per 250-lb. bbl., alongside dock, New York. Raw crushed rock, $3.50@$4.50; calcined stucco, $9; f.o.b. works, Illinois.

Kaolin—See China Clay.

Limestone—Dolomite, 1@2 man size, $1.60@$1.65; 2@8 in., $1.55@$1.65 per net ton, f.o.b. Plymouth Meeting, Pa.; fluxing, $1.65@$1.75 per net ton, f.o.b. Howellville, Pa.

Magnesite, Calcined — High-grade caustic calcined, lump form, $35@$40 per ton, carload lots, f.o.b. California points. In Chicago district, $57.70; Atlantic seaboard, $61@$63.

Dead-Burned — $38 per net ton, Chewelah, Wash.; $58@$64, Chester, Pa. Austrian grade, $55@$60 per ton, f.o.b. Baltimore. (Magnesite brick—See Refractories.)

Mica—India block mica, slightly stained, per lb.: No. 6, 50c.; No. 5, $1.20@$1.40; No. 4, $2@$3; No. 3, $4.25@$5; No. 2, $5.50@$7; No. 1, $8. Clear block: No. 6, 55c.; No. 5, $1.75; No. 4, $3.25; No. 3, $5; No. 2, $6.50; No. 1, $8; A1, $10; extra large, $25; all f.o.b. New York; ground, $150 per ton, Philadelphia. Domestic, uncut, f.o.b. Franklin, N. C., as follows: Scrap, $45@$50 per ton; punch, 10c. per lb.; circle, 15@25c.; 1½ x 2 in., 75c.; 2 x 2 in., $1.15; 2 x 3 in., $1.65; 3 x 3 in., $2.10; 3 x 4 in., $2.50; 3 x 5 in., $2.75; 3 x 6 in., $3.75; ground 165 mesh, $150@$170 per ton; ground roofing mica, $60; mica washers, 75c.@$2 per lb.; 1¼-in. disks, No. 1, $1.40 per lb.; No. 2, $1.25. The foregoing domestic prices obtain also in the Chicago district.

[1]**Monazite**—Minimum of 6 per cent thorium oxide, quoted $30 per unit, duty paid.

Phosphate Rock—Per long ton, Florida ports: 77 per cent tricalcium phosphate, $13; 75 per cent, $11.50; 75@74 per cent, $11; 70 per cent, $8.35; 68 per cent, $7.85; 68@66 per cent, $7.60. Finely ground Tennessee rock sells for $8.50 per net ton for 13 per cent phosphorus content, agricultural application; for acid-making, 14 per cent, $9; both prices f.o.b. Centerville, Tenn.

Pumice Stone—Imported, lump, 4@50c. per lb.; domestic lump, 6c.; ground, 4@7c., all f.o.b. New York.

Pyrites—Spanish fines, per unit, 12c., c.i.f. Atlantic seaport; furnace size, 16½c.; Spanish lump, 14@16c.; domestic fines, f.o.b. mines, Georgia, 12@14c.

Quartz—(Acid tower) fist to head, $10; 1¼ to 2 in., $14; rice, $17; all net ton, f.o.b. Baltimore; lump, carload lots, $5@$7.50 net ton, f.o.b. North Carolina mines.

Sand (Glass)—Dry glass sand, $4 per net ton, f.o.b. cars Mapleton, Pa. Sand, f.o.b. Ottawa, Ill., is $3 per ton; $2.50 on annual contracts. Sand at Klondike, Gray Summit and Pacific, all in Missouri, is $2.50 on contract; some outside sales have been made at $4. St. Louis, open market, at $3.50; contract price on large quantities, $2.50; on small quantities, $3.

Sulphur—$18 per ton for domestic; $18@$20 for export, f.o.b. Texas and Louisiana mines. Market quiet.

Talc—Paper making, $12@$22 per ton; roofing grades, $9.50@$15; rubber grades, $12@$18; all f.o.b. Vermont. California talc, $20@$45, talcum powder grade. Southern talc, powdered, carload lots, $12@$15 per ton; less than carload, $25, f.o.b. cars; freight to New York $5.25 per ton, carload lots; less than carload lots, $9.25. Imported, $60@$70; Canadian, $20@$40 per ton.

Mineral Products

Arsenic — White arsenic, 11½@12c. per lb.; sulphide, powdered, 15@15½c. per lb. in carload lots.

Sodium Nitrate—$3 per cwt. ex vessel, Atlantic ports. Market quiet.

Sodium Sulphate—For 95 per cent material, $22 per ton, f.o.b. mines, Idaho and Arizona, spot and six months' contract.

Potassium Sulphate—Domestic, $225@$250 per net ton, basis 90 per cent, f.o.b. New York.

Ferro Alloys

Ferrocarbontitanium—For 15 to 18 per cent material, $200@$225 per ton, f.o.b. Niagara Falls, N. Y.

Ferrocerium—Per lb., $12@$15.

Ferrochrome—Carload lots, spot and contract, 60 to 70 per cent chromium, 6 to 8 per cent carbon, 16@17c. per lb. of chromium contained; 4 to 6 per cent carbon, 17@18c., f.o.b. works.

Ferromanganese—Domestic 76 to 80 per cent, $120@$125, freight allowed; $120, f.o.b. seaboard bases; resale, $115; English, $135@$140, c.i.f. Atlantic seaports. Spiegeleisen, 18@20 per cent, $60, f.o.b. furnace.

[1]**Ferromolybdenum**—Standard grades, carrying from 50 to 60 per cent molybdenum metal, with low sulphur, phosphorus, and arsenic, $2 per lb. of contained metal, f.o.b. works.

Ferrosilicon—For 10 to 15 per cent, per gross ton, f.o.b. works, $55@$60; 50 per cent, $78@$80; 75 per cent, $150.

[1]**Ferrotungsten**—Domestic, 70 to 80 per cent W, 55@60c. per lb. of contained tungsten, f.o.b. works. Foreign, 60c.

[1]Furnished by Foote Mineral Co., Philadelphia, Pa.

Ferro-uranium—35 to 50 per cent U, $7 per lb. of U contained, f.o.b. works.

[1]**Ferrovanadium**—Basis 30 to 40 per cent, $6.50@$7 per lb. of V contained, according to silicon content, f.o.b. works.

Metal Products

Copper Sheets—Current New York list price, 22½c. per lb.; wire, 16½c.

Lead Sheets—Full lead sheets, 9½c.; cut lead sheets, 9½c. in quantity, mill lots.

Nickel Silver—Unchanged at 34¾c. per lb. for 18 per cent nickel.

Yellow Metal — Dimension sheets, 21½c.; sheathing, 21½c.; rods, ⅝ to 3 in., 18½c.

Zinc Sheets—$11.50 per 100 lb., less 8 per cent on carload lots, f.o.b. smelter; zinc plates, 11½c. per lb.

Refractories

Bauxite Brick—56 per cent alumina, $160 per 1,000, f.o.b. Pittsburgh.

Chrome Cement—40@45 per cent Cr_2O_3, $55@$60 per net ton, and $65 in sacks, carload lots, f.o.b. eastern shipping points.

Fire Brick—First quality, 9-in. shapes, $55@$60 per 1,000, Pennsylvania, Ohio and Kentucky. Second quality, $45@$50.

Magnesite Brick — 9-in. straights, $110 per net ton; 9-in. arches, wedges and keys, $120; soaps and splits, $130.

Silica Brick—9-in., per 1,000: Chicago district, $65@$70; Birmingham, Ala., $56@$61; Mount Union, Pa., $55@$60.

Iron Trade Review

Pittsburgh, Dec. 28, 1920

Nearly all the independent steel plants are closed this week, or are operating only a few departments. Pipe departments of mills are operating fairly well.

The independent rail mills have come down to the Steel Corporation or Industrial Board prices, $45 for bessemer and $47 for openhearth rails, and rail orders for 1921 will be somewhat larger in consequence, probably aggregating close to 2,000,000 tons for renewals alone. The Pennsylvania system has distributed orders for 200,000 tons.

Pig Iron—Prices are nominally unchanged at $35 for foundry and bessemer and $33 for basic, Valley basis, but these are hardly even asking prices, as there is no inquiry. In some quarters it is predicted that after the first of the year asking prices will be $31 or $32 for foundry, $32 for bessemer, and $30 for basic.

Semi-finished Steel—The market is dead. Sheet bars are nominally $47.

Charcoal and Coke

Charcoal—Willow, 7c. per lb. in bbls.; hardwood, 5½c. per lb., in 250-lb. bbls. Barrel charge is 35c. additional.

Connellsville—Furnace, $7; foundry, $6.

Domestic and European Zinc Conditions

The Market Has Declined Steadily, and Exports Are Relatively Small—English Zinc-Smelting Industry at a Standstill—Germany an Active Seller—Australian Producers in a Favorable Position and the United States Has Greatly Curtailed Production

THE zinc market, both abroad and in the United States, declined steadily in 1920, except for a reaction in price that occurred during the summer.

The zinc industry responded to the lower price of zinc quicker than either the lead or copper industry in curtailing operations drastically. The Anaconda Copper Mining Co. has cut its zinc production from 10,000,000 to 5,000,000 lb. monthly. Interstate-Callahan Mining Co. has shut down, Butte & Superior Mining Co. has suspended productive operations, the American Metal Co. has curtailed its output, and many other important operating companies have taken similar steps.

MONTHLY AVERAGE PRICES OF ST. LOUIS ZINC

In Cents Per Pound

1920		1920	
January	9.133	July	7.720
February	8.708	August	7.835
March	8.531	September	7.661
April	8.184	October	7.150
May	7.588	November	6.247
June	7.465		

The chief factor in the decline in the zinc market has been the condition of the European market, the practical elimination of export trade and the possibility of importing low-priced zinc into the United States. Export trade due to the favorable conditions arising out of the war held up splendidly for the first half of 1920, during which time the metal was leaving this country at the rate of from 16,000 to 17,000 tons per month. During October, however, to illustrate the sharp decline in the volume of shipments, only 1,329 tons of domestic material and 115 tons of zinc produced from foreign ores were exported. Although the record for the entire year will show up well, the tendency in the fall of 1920 does not indicate that export trade in the volume desired can be maintained.

Practically All English Zinc Smelters Shut Down

In view of the importance of the foreign situation in zinc, the recent report of the European correspondent of the American Zinc Institute is of moment. The report states that in the United Kingdom, apart from a couple of furnaces running at the New Delaville works, mainly on the retreatment of zinc residues, and one or two other furnaces, zinc smelting has been entirely suspended. Zinc smelting in Great Britain is not noted for economy in fuel consumption, and the estimate is given that slab zinc cannot be produced in England under £50 per ton (quotations on the London market are now around £25). There are still about 20,000 tons of slab zinc in the British government's hands, a stock at the present time regarded as formidable, although one that normally would be quickly absorbed by the galvanizing trade.

Belgian producers have been adversely affected by the decline in the London market. Unsold stocks of slab zinc and zinc sheets in Belgium are estimated at over 30,000 tons, which is being held for higher prices—£44 to £45 per ton, said to represent the actual producing cost for slab zinc. Conditions in Europe are awaiting a settlement of the political and industrial situation. The restoration of Europe and the devastated areas of northern France has not progressed markedly, and metals and materials in enormous quantities will be required when the work is in full swing.

As to France, the report states that few retorts are in operation, the price of coal and coke alone being a stumbling block to economical smelting.

Germany seems to be able to take advantage of the depreciation of the mark in selling zinc below £40, as German labor, coal, and supplies are paid for in paper marks, whereas the product is sold in pounds sterling. The cost of coal, for one thing, is controlled by the German government and fixed at 100 to 120 marks per ton. Figured in English currency this is equal to 7s. 6d. per ton, which, when compared with the Belgian and British actual prices of 40s. and 45s. per ton, respectively, indicates the advantage accruing to the German producer in point of lower production costs. The industrial position of Germany is far from good, and the country is near bankruptcy. German manufacturers are eagerly awaiting the day when trade with Russia will be reopened. Slab zinc unsold in Germany amounts to less than 20,000 tons, but as long as this continues to be offered, either direct or through Scandinavia, at under £40, the London market has no chance whatever of developing strength.

The new zinc plant adjacent to the Tata Steel Works, in India, is reported to be making good progress, but the opinion is ventured that zinc smelting in India cannot hope to show better results than was the case in Japan, where the industry is now almost dead. Successful zinc smelting requires suitable labor, superior coal, and good refractories, but in all three of these prerequisites India is deficient, labor being unused to charging zinc furnaces, Indian coal being of inferior quality, and the discovery of higher-class clay in India not having been announced.

Artificial Character of London Market

The zinc mines of North Africa are shut down, and the output of zinc ore in Spain is limited to the dwindling requirements of Belgium and Germany. No ore supplier will agree to contract on the basis of the London monthly market price for zinc, which dealers maintain is artificial, and applicable only as long as the weakness of the German exchange governs the situation.

The terms of the settlement of the Broken Hill strike mean a considerable reduction in Australian ore supplies, chiefly because the agreement establishes a five-day working week and the abolishment of the night shift. It is now assured that the annual quantity of zinc concentrates will fail to reach the maximum which the British government is required to accept for the next nine years under its contract with the Australian producers. Several hundred thousand tons of concentrates are stocked at Broken Hill for shipment, but steamers to carry the material at £5 per ton to Belgium are scarce because of the higher freight paid for cargoes of coal to Sweden.

The Position of Zinc-Producing Nations

Despite the favorable position of the Australian and particularly Tasmanian zinc producers, Belgium is the key to the world's zinc situation, owing to a better understanding of the technique of the industry. In the future Germany is expected to hold her own; France will re-enter with her prewar production in about two years; Spain has greater possibilities as a producer of zinc oxide than of the metal; Russia will take years to recover; England is in a hopeless position as a zinc producer; India's efforts at zinc production are not likely to meet with greater success than Japan's, and the United States production, henceforth, must be limited to the extent of domestic requirements, as production costs will not permit of competition with European zinc.

COMPANY REPORTS

Mining Dividends for December, 1920

The following is a partial list of dividends paid by mining companies during December, 1920.

Mining and Metallurgical Companies in United States	Situation	Per Share	Total
Amer. Sm. & Ref.	U. S. & Mex.	$1.00q	$609,980.00
Amer. Sm. & Ref., pfd.	U. S. & Mex.	1.75q	875,000.00
Calumet & Arizona, c	Ariz.	1.00q	642,520.00
Cardiff Mining, l.s	Utah	.15	75,000.00
Con. Interstate-Callahan, g.l	Idaho	.50q	161,651.50
Daly West Mining, s.l.	Utah	.25q	62,500.00
Eagle & Blue Bell, g.s.l.	Utah	.25k	223,290.00
Federal M. & S., pfd., s.l.	Idaho	1.75q	210,000.00
Golden Cycle, g.	Col.	.02q	30,000.00
Hecla Mining, l.	Idaho	.15qx	150,000.00
Kennecott Copper	.....	.50q	1,393,530.00
Ray Consolidated Copper	Ariz.	.25q	394,294.50
St. Joseph Lead	Mo.	.50qx	704,734.00
United Verde Copper	Ariz.	1.50q	450,000.00
Utah Copper	Utah	1.50q	2,436,735.00
Mining and Metallurgical Companies in Canada, Mexico and South America			
Cerro de Pasco Copper	Peru	$1.00q	$898,229.00
Hollinger Consol., gold	Ont.	.05bm	246,000.00
St. John del Rey, g.	Brazil	9d. sa	£2,250
St. John del Rey, pfd. 10%	Brazil	1 sh. sa	£5,000
Holding Companies			
Great Northern Iron Ores	Minn.	$2.00	$3,000,000.00

bm, bi-monthly; k, irregular; q, quarterly; sa, semi-annual; x, includes extra.

The following companies passed dividends usually declared at this time: Ahmeek Mining, Arizona Copper, Chino Copper, Copper Range, Cresson Consolidated Gold, Nevada Consolidated Copper, Quincy Mining, Mining Corporation of Canada, and Yukon-Alaska Trust.

Minerals Separation North American Corporation, which is organized under Maryland laws, distributed on Dec. 31, 1920, $1 per share in 4¾ per cent Victory notes at par. National Lead Co. distributed its usual quarterly dividends of 1¾ per cent on common and of 1¾ per cent on its preferred stock. New Idria Quicksilver Mining Co. consented to the appointment of a receiver, as requested by part of the stockholders, with a view to improving the organization of the company.

Chile Copper Co. Increases Income

The fifteenth quarterly report of the Chile Exploration Co. for the third quarter of 1920 states that during the quarter ended Sept. 30 there was treated 1,104,648 tons of ore, averaging 1.51 per cent copper.

The cost of copper produced during the quarter was only 11.179c. per lb., including selling and delivery expense, but excluding depreciation of Federal taxes and with no credit for miscellaneous income.

The financial statement of the Chile Copper Co. and Chile Exploration Co. combined (earnings being based on copper actually delivered), shows for the quarter ended Sept. 30, as compared with the preceding quarter, as follows:

	Third Quarter, 1920	Second Quarter, 1920
Pounds copper delivered	23,962,212	21,482,572
Net profit on copper delivered	$2,105,159.58	$1,597,360.27
Miscellaneous income	(a) 30,101.90	50,121.62
Interest on call loans and bank balances of the Chile Copper Co.	240,192.31	237,919.56
Total income	$2,315,249.99	1,885,401.45
Depreciation	604,674.91	633,091.40
Amortized discount on fifteen-year 6 per cent convertible bonds	35,000.00	35,000.00
Accrued bond interest of Chile Copper Co.	787,203.75	787,203.75
Expenses of Chile Copper Co.	10,363.17	5,392.12
Total charges	$1,437,241.83	$1,460,687.27
Balance undivided profits for quarter both companies	$878,008.16	$424,714.18

In this period of world-wide disturbed economic and financial readjustment, the companies had on Dec. 15, $11,163,000, representing cash on hand and Liberty bonds and about $275,000 due for copper delivered but not yet paid for at that date.

Shattuck Arizona Shows Loss for Third Quarter

Copper, Lead; Arizona

The production of copper and of gold and silver from copper ores of the Shattuck Arizona Copper Co. for the quarter ending Sept. 30, 1920, was less than that of the previous quarter, owing to the fact that less copper ore was mined. The production of lead and of gold and silver from lead ores was considerably more than in the previous three month, as more tons were milled and of better grade. A summary of production for the third quarter is as follows:

Dry tons copper ores smelted		4,915	
Dry tons lead concentrates smelted		4,663	
Dry tons lead ores smelted		53	
Metals recovered from	Copper Ore	Lead Concentrates	Lead Ore
Pounds copper	527,454	.....	.....
Pounds lead	.....	2,398,123	7,127
Ounces gold	145	1,286	5
Ounces silver	16,953	119,534	677

The copper production for the third quarter is inventoried at 15c. per lb. The returns on lead are actual smelter settlements. The results of operations for the third quarter are as follows:

Copper ore and bullion		$79,118.10
Gold and silver		16,886.67
Lead concentrates settlements		349,056.84
Direct lead and sorted ore settlements		421.78
Interest		10,993.17
Total		$456,476.56
Copper operating expense and development	$185,015.58	
Milled lead expense	258,250.07	
Administrative expense	12,993.29	456,258.94
		$217.62
Depreciation of mine and mill equipment		19,327.06
Loss for quarter, exclusive of depletion		$19,109.44

Lead mining and milling operations have been conducted at nearly full capacity of the concentrating plant. New development work totaled 2,150 ft.

Barnes-King Development Co.

Gold, Silver; Montana

The records of the Barnes-King Development Co. show the following operating results for the quarter ending Sept. 30, 1920:

EARNINGS		
Shannon property		$10,232.35
Kendall property		1,338.94
Interest received		229.29
Total		$11,800.58
DEDUCT		
Loss on operations on—		
North Moccasin property	$20,030.84	
Piegan-Gloster property	6,224.72	
Black Hawk's development	949.09	
Miscellaneous expense	2,391.47	
Total		$29,596.12
Difference being net loss on operations for quarter ending Sept. 30, 1920		$17,795.54

The above figures include provisions for depreciation on the various plants of the company on the same basis as has been used heretofore. Owing to the small tonnage of ore remaining in the North Moccasin mine, and that of low grade, the directors decided during the quarter to lease the mine. Accordingly, the property was leased Sept. 24. The last production from this property, on company account, was for the month of July, when 240 tons of ore were milled, yielding $1,335.79 in bullion. In addition, a clean-up yielded $1,465.23, making total production for the quarter $2,801.02.

As previously reported, the Piegan-Gloster mine was shut down in May, of this year, and will not be opened again while costs of operating continue as high as at present.

MINING STOCKS

Week Ended December 25, 1920

Stock	Exch.	High	Low	Last	Last Div.	
COPPER						
Adventure	Boston			*50		
Ahmeek	Boston	44	40½	41	Sept. '20, Q	.50
Alaska-B.C.	N. Y. Curb	7/16	1/8	7/16		
Alloues	Boston	18	15	17	Mar. '19,	1.00
Anaconda	N. Y.	35	30	32	Nov. '20, Q	1.00
Ariz. Com'l	Boston	6½	5½	5½	Oct. '18,	.50
Big Ledge	N. Y. Curb	¾	½	7/16		
Bingham Mines	Boston	9¼	9	9	Sept. '19, Q	.25
Calumet & Aris	Boston	43	40	42	Dec. '20, Q	1.00
Calumet & Hecla	Boston	221	206	211	June '20, Q	5.00
Canada Copper	N. Y. Curb			*20		
Centennial	Boston	6⅝	6½	6½	Dec. '18, SA	1.00
Cerro de Pasco	N. Y.	26½	24½	25⅝	Dec. '20, Q	1.00
Chief Consol	Boston Curb	2⅜	2⅜	2⅜	Nov. '20, Q	.10
Chile Copper	N. Y.	9⅛	8⅜	9⅛		
Chino	N. Y.	18⅛	16⅛	17⅛	Sept. '20, Q	.37½
Columbus Rexall	Salt Lake	*32½	*32	*32		
Con. Aris	N. Y. Curb			1/16	Dec. '18, Q	.05
Con. Copper M.	N. Y. Curb	2	2	2		
Copper Range	Boston	26½	25	26⅛	Sept. '20, Q	.50
Crystal Copper (new)	Boston Curb	*43	*40	*40		
Davis-Daly	Boston	5⅛	4⅞	4⅞	Mar. '20, Q	.25
East Butte	Boston	7⅛	7⅛	7⅛	Dec. '19, A	.50
First Nat'l	Boston Curb	*61	*50	*61	Feb. '19, SA	.15
Franklin	Boston	2⅛	2⅛	2⅛		
Gadsden Copper	N. Y. Curb			*70		
Granby Consol	N. Y.	18	15	17⅛	May '19, Q	1.25
Greene Cananea	N. Y.	18	15	16⅛	Nov. '20, Q	.50
Hancock	Boston	3⅛	3	3		
Houghton	Boston Curb	*35	*30	*35		
Howe Sound	N. Y. Curb	2	2⅛	2⅛	Oct. '20, Q	.05
Inspiration Con	N. Y.	29	28	28	Oct. '20, Q	1.00
Iron Cap	Boston Curb	6⅛	6	6	Sept. '20, K	.25
Isle Royale	Boston	17	15⅛	16	Sept. '19, SA	.50
Kennecott	N. Y.	17	14⅛	15⅛	Dec. '20, Q	.50
Keweenaw	Boston	1⅛	1⅛	1⅛		
Lake Copper	Boston	1⅛	1⅛	1⅛		
La Salle	Boston	1⅛	1⅛	1⅛		
Magma Chief	N. Y. Curb			*21		
Magma Copper	N. Y. Curb	16	16	16	Jan. '19, Q	.50
Majestic	Boston Curb	*8	*8	*8		
Mason Valley	Boston	*100	*90	*90		
Mass Consol	Boston	2⅜	1⅜	2	Nov. '17, Q	1.00
Mayflower-O.C.	Boston	4	3 3/16	3		
Miami	N. Y.	15⅜	14⅛	15	Nov. '20, Q	.50
Michigan	Boston	2	2	2		
Mohawk	Boston	44	42⅛	42⅛	Nov. '20, Q	1.00
Mother Lode (new)	N. Y. Curb	5⅛	5⅛	5⅛		
Nevada Con	N. Y.	8⅛	8⅛	8⅛	Sept. '20, Q	.25
New Arcadian	Boston			2⅛		
New Baltic	Boston Curb			3		
New Cornelia	Boston	14⅛	13⅛	14	Aug. '20,	.25
Nixon Nev	N. Y. Curb			*5		
North Butte	Boston	9 3/16	8⅜	9⅛	Oct. '18, Q	.25
North Lake	Boston			*25		
Ohio Copper	N. Y. Curb			3/16		
Ojibway	Boston	1⅜	1⅛	1⅜		
Old Dominion	Boston	15⅜	15	15⅛	Dec. '18, Q	1.00
Osceola	Boston	23⅛	21⅜	21⅜	June '20, Q	.50
Phelps Dodge	Open Mar.	†175	†150		Oct. '20, Q	2.50
Quincy	Boston	36	34⅛	35⅛	Mar. '20, Q	1.00
Ray Con	N. Y.	11⅛	10⅜	11⅜	Dec. '20, Q	.25
Ray Hercules	Boston Curb			*50		
St. Mary's M. L.	Boston	29	25⅜	27⅛	June '20, K	2.00
Seneca Copper	Boston			17⅛		
Shannon	Boston	0.80	0.60	0.70	Nov. '17, Q	.25
Shattuck Ariz	N. Y.	5⅛	4⅞	5⅛	Jan. '20, Q	.25
South Lake	Boston			2		
South Utah	Boston	*3	*3	*3		
Superior Copper	Boston	3⅛	3	3⅛	Apr. '17,	1.00
Superior & Boston	Boston	1⅜	1	1⅜		
Tenn. C. & C.	N. Y.	7⅛	6⅜	6⅞	May '18, I	1.00
Tuolumne	Boston	*38	*35	*38	May '13.	.10
United Verde Ex.	Boston Curb	23	20⅞	23	Nov. '20, Q	.50
Utah Consol	Boston	3⅛	3	3	Sept. '18,	.25
Utah Copper	N. Y.	47⅛	44⅛	47⅛	Sept. '20, Q	1.50
Utah M. & T.	Boston	*95	*85	*85	Dec. '17,	.30
Victoria	Boston			1⅛		
Winona	Boston	*45	*35	*35		
Wolverine	Boston	10	8⅛	8⅛	Jan. '20, Q	.50
LEAD						
Hecla Mining	N. Y. Curb	4⅛	3 13/16	3⅞	Dec. '20, QX	.15
St. Joseph Lead	N. Y.	11⅛	10	11⅛	Dec. '20, QX	.50
Stewart	Boston Curb			*6	Dec. '15,	.05
Utah Apex	Boston	2⅜	2⅛	2⅛	Nov. '20, K	.25
ZINC						
Am. Z. L. & S.	N. Y.	6⅛	5⅜	6⅛	May '17,	1.00
Am. Z. L. & S. pf.	N. Y.	30	27	29	Nov. '20, Q	1.50
Butte C. & Z.	N. Y.	4⅛	3⅞	4	June '18, I	.50
Butte & Superior	N. Y.	8⅛	8	8⅛	Sept. '17,	1.25
Con. Interst. Cal.	N. Y.	5⅛	4⅛	4⅛	Dec. '20, Q	.50
New Jersey Z.	N. Y. Curb	128	127	127	Nov. '20, Q	4.00
Success	N. Y. Curb	*2	*1⅞	*2	July '16,	.03
Yellow Pine	Los Angeles	*45	*45	*45	June '20, Q	.03

Stock	Exch	High	Low	Last	Last Div.	
GOLD						
Alaska Gold	N. Y.	1	5/8	7/8		
Alaska Juneau	N. Y.	1⅛	⅝	¾		
Carson Hill	N. Y. Curb			22⅛		
Cresson Consol. G.	N. Y. Curb	1¼	1⅛	1¼	June '20, Q	.10
Dome Ex.	Toronto			*41		
Dome Mines	N. Y.	10	9⅛	9⅛	Oct. '20, Q	.25
Golden Cycle	Colo. Sprgs.	‡		*73	Dec. '20, Q	.02
Goldfield Con.	N. Y. Curb	*6	*4	*5	Dec. '19,	.05
Hedley	Boston			4¼	June '19,	.10
Hollinger Con.	Toronto	5.60	5.50	5.50	Dec. '20, BM	.05
Homestake	N. Y.	50	48	50	Sept. '19,	.50
Kirkland Lake	Toronto	*39¾	*39¾	*39¾		
Lake Shore	Toronto	1.06	1.06	1.06	Oct. '20, K	.02
McIntyre-Porcupine	Toronto	1.84	1.78	1.80	Sept. '20, K	.05
Porcupine Crown	Toronto			*17½	July '17,	.03
Portland	Colo. S rgs.	‡		*60	Oct. '20, Q	.01½
Reorgan. Booth	N. Y. Curb	*4	*2½	*3½	May, '19,	.05
Silver Pick	N. Y. Curb	*6	*4	*5		
Teck Hughes	Toronto	*11½	*11	*11½		
Tom Reed	Los Angeles	1.22½	1.17	1.22	Dec. '19,	.02
United Eastern	N. Y. Curb	2⅜	2⅜	2⅜	Oct. '20, Q	.15
Vindicator Consol	Colo. Sprgs.	‡		*18	Jan. '20, Q	.01
West Dome Consol	Toronto	*6	*5½	*5½		
White Caps Min.	N. Y. Curb	*5½	*3	*5		
Yukon Gold	Boston Curb			1⅛	June '18,	.02½
SILVER						
Arizona Silver	Boston Curb	*20	*18	*20	Apr. '20, M	.03
Beaver Con.	Toronto	*27½	*27	*27	May '20, K	.03
Coniagas	Toronto			2.00	Nov. '20, Q	.12½
Crown Reserve	Toronto			*15	Jan. '17,	.05
Kerr Lake	Boston	2⅞	2⅜	2⅜	Oct. '20, K	.12½
La Rose	Toronto	*22	*22	*22	Apr. '18,	.02
McKinley-Dar.	Toronto			*24	Oct. '20, Q	.05
Mining Corp.	Toronto	1.00	1.00	1.00	Sept. '20, Q	.12½
Nipissing	N. Y. Curb	7⅛	7⅛	7⅛	Oct. '20, QX	.50
Ontario Silver	N. Y.	4⅛	4	4⅛	Jan. '19, Q	.50
Ophir Silver	N. Y. Curb	1/16	⅛	1/16	Jan. '12,	.10
Peterson Lake	Toronto			*9½	Jan. '17,	.01½
Temiskaming	Toronto	*25	*25	*25	Jan. '20, K	.04
Trethewey	Toronto	*17	*16	*16	Jan. '19,	.05
GOLD AND SILVER						
Atlanta	N. Y. Curb	*1⅛	*1	*1⅛		
Barnes-King	Butte	‡		1.11	Aug. '20, Q	.05
Bost. & Mont.	Boston			*63		
Cashboy	N. Y. Curb	*5½	*4	*4½		
El Salvador	N. Y. Curb	⅜	⅜	⅜		
Jim Butler	N. Y. Curb	*19	*14	*18	Aug. '18, SA	.07
Jumbo Extension	N. Y. Curb	*5	*4	*5	June '16,	.05
Louisiana Con.	N. Y. Curb	¼	⅛	¼		
MacNamara M.	N. Y. Curb	1/16	1/16	1/16	May '10,	.02½
N.Y. Hond. Rosar.	Open Mar.	†11	†9		Oct. '20, QX	.50
Tonopah-Belmont	N. Y. Curb	1⅛	1 1/16	1⅛	Oct. '20, Q	.05
Tonopah-Divide	N. Y. Curb	1 1/16	1	1⅛		
Tonopah Ex.	N. Y. Curb	1⅛	1⅛	1⅛	Oct. '20, Q	.05
Tonopah Mining	N. Y. Curb	1⅛	1⅛	1 1/16	Oct. '20, SA	.05
West End Con.	N. Y. Curb	1/16	⅛	1/16	Dec. '19, SA	.05
SILVER-LEAD						
Caledonia	N. Y. Curb	*17	*15	*16½	July '20, M	.01
Consol. M. & S.	Montreal	16½	15½	15⅝	Oct. '20, Q	.62½
Daly Mining	Salt Lake			2.00	July '20, Q	.10
Daly-West	Boston	3½	3½	3½	Dec. '20, Q	.25
Eagle & Blue Bell	Boston Curb			2½	Dec. '20, K	.25
Electric Point	Spokane	*5	*4	*5	May '20, SA	.03
Fed. M. & S.	N. Y.	5⅛	5	5⅛	Jan. '09	1.50
Fed. M. & S. pf.	N. Y.	24¼	21½	22½	Dec. '20, Q	1.75
Florence Silver	Spokane	*14	*10	*14	Apr. '19,	.01½
Grand Central	Salt Lake			*37½	June '20, K	.05
Iron Blossom	N. Y. Curb	⅛	1/16	1/16	Apr. '20, Q	.02½
Judge M. & S.	Salt Lake	3.25	3.17½	3.17½	Sept. '20, Q	.12½
Marsh Mines	N. Y. Curb	*8	*6	*7		
Prince Consol.	N. Y. Curb	1/16	1/16	1/16	Nov. '17,	.02½
Rambler-Cariboo	Spokane	*7½	*6	*7½	Feb. '19,	.01
Rex Con.	N. Y. Curb	*5	*4	*5		
South Hecla	Salt Lake	*65	*65	*65	Sept. '19, K	.15
Stand. S. L.	N. Y. Curb	1/16	⅛	1/16	Oct. '17,	.05
Tamarack-Custer	Spokane	1.80	1.25	1.80	Dec. '19, K	.03
Tintic Standard	Salt Lake	3.37½	3.00	3.05	June '20, Q	.10
Wilbert Mining	N. Y. Curb	*1⅛	*1	*1	Nov. '17,	.01
NICKEL-COPPER						
Internat'l Nickel	N. Y.	12⅜	11⅛	12⅛	Mar. '19,	.50
Internat'l Nickel, pf.	N. Y.	79¼	79	79¼	Nov. '20, Q	1.50
QUICKSILVER						
New Idria	Boston	*76	*60	*60	Jan. '19,	.25
TUNGSTEN						
Mojave Tungsten	Boston Curb			*5		
VANADIUM						
Vanadium Corp.	N. Y.	37	28⅛	30	Oct. '20, Q	1.50
ASBESTOS						
Asbestos Corp.	Montreal	80	64	72	Oct. '20, Q	1.50
Asbestos Corp. pf.	Montreal	85	83	83	Oct. '20, Q	1.75
MINING, SMELTING AND REFINING						
Am. S. & R.	N. Y.	39⅛	32⅛	35	Dec. '20, Q	1.00
Am. S. & R. pf.	N. Y.	80⅜	74	74	Dec. '20, Q	1.75
Am. Sm. pf. A	N. Y.			68⅛	Oct. '20, Q	1.50
U. S. Sm. R. & M.	N. Y.	33	31	31½	Oct. '20, Q	1.50
U. S. S.R. & M. pf.	Boston	41	40	41	Oct. '20, Q	.87½

*Cents per share. †Bid or asked. ‡Quotations missing. Q. Quarterly SA, Semi-annually. BM, bi-monthly. K, Irregular. I Initial. X, includes extra

INDUSTRIAL NOTES

China a Great Export Field for Mining Machinery

C. M. Manners, managing director of the China Mutual Trading Co., Ltd., Shanghai, while in America recently on his way to China said:

"Our company, engaged in Anglo-Chinese trade, is agent in China for Handley Page Co., and Marconi Co., of China. We also represent the Pekin Syndicate, the largest Anglo-China corporation now operating, which handles dyes, engineering supplies, and chemicals.

"China offers a tremendous field for export business, particularly in the line of mining machinery and chemicals. One thing not usually taken into account is the cheap labor. This will retard the importation of agricultural machinery to a considerable extent. Our business is handled through British banks, and we experience no difficulty in financing our trade. Reports that Chinese banks are organizing along modern lines are greatly exaggerated. Personally, I have not noticed any great change. The A. B. C. Club is wielding a great influence toward promoting good feeling among the countries concerned."

Educating Their Customers

The British official *Board of Trade Journal* recently stated that

"An educational course is being organized under the auspices of the British Consulate in Mexico City and the British Chamber of Commerce, in co-operation with the Educational Department of the Ministry of Commerce, Industry, and Labor. In this course attention is given to the study of the principal British industrial centers, and their products, Mexican centers of production, the reciprocal commercial needs of both countries, means of communication, the leading British import and export houses, general and special traffic conditions, existing freight rates, customs requirements and specifications, and in fact, the mutual benefits to be obtained from commerce between Mexico and Great Britain, and the advantages and possibilities of its development."

This illustrates one of the ways by which the businesslike government of a businesslike people goes after foreign trade—and gets it.

The "motorcade" is coming into verbal fashion—to be added to such terms as camouflage and barrage, says the *Boston News Bureau*. It is coined in motordom to signify a train or caravan of motor trucks, presumably being suggested by cavalcade. Another abbreviation beginning to appear is "truckportation."

Concrete Stacks Appear Like Tile

The handsome little monthly *Concrete in Architecture and Engineering* always contains interesting illustrations of successful industrial applications of reinforced concrete construction. The following is taken from one of its recent issues:

"Good draft, fuel economy, freedom from maintenance costs, stability against wind storms and other tendencies of the elements to do damage are important in chimneys of industrial plants. In this field of construction the adaptability of concrete is displayed to good advantage, as it meets all the requirements if used after a number of successful systems of concrete stack construction. One of these systems, which to the uninitiated will not at once appear to be an application of concrete, is the Wiederholdt system as used by the Wiederholdt Construction Co., of St. Louis. On the exterior, Wiederholdt chimneys present the appearance of being of clay tile, but the tile acts merely as a mold into which reinforcing steel and concrete are placed.

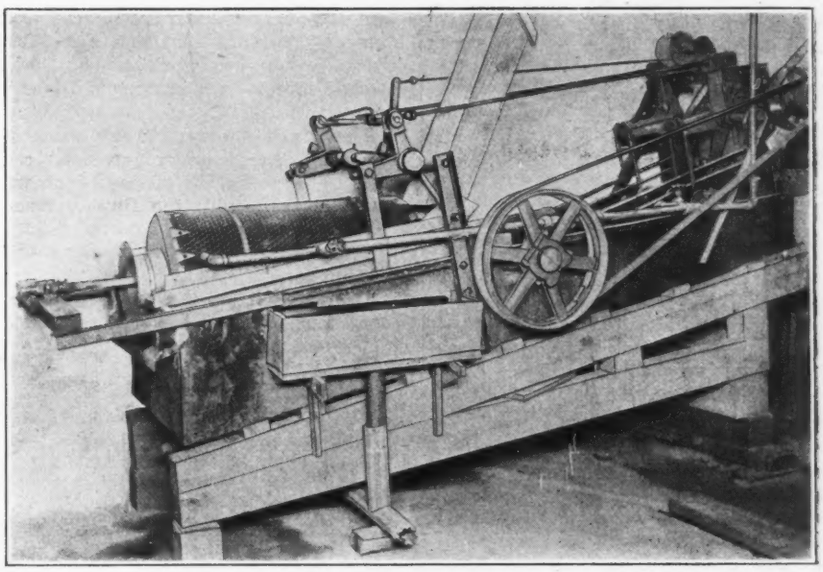
The specially designed tile used in the construction of Wiederholdt stacks is so formed that both vertical and horizontal reinforcement is easily placed and held in position. The end walls of each tile unit are knocked out after the tile is in position, so that when the concrete is in place the result is practically a monolithic, reinforced concrete shell wall between an outside and inside facing of hard burned tile.

"Foundations for Wiederholdt stacks are built in the usual manner. Vertical bars tie the shell of the stack into the foundation. The tile molds and concrete stack shell are built up simultaneously, and one course of tile is filled with concrete before another is added. The tile are laid up with cement mortar and the concrete filling is placed in small quantities."

New Ore Washing Device Described

Dorr Washer and Classifier Consumes Little Power—Model Tested at Minnesota School of Mines

A new device for concentrating iron ores may find an application in the silica or sand and gravel industries as well, as a result of tests at the Minnesota School of Mines. The material to be washed enters through the feed spout and falls directly into the revolving screen, where the coarse material is completely washed before being discharged over the rear end of the classifier. The material that passes through the openings in the screen enters the tank of the classifier, where the coarser and heavier particles settle to the bottom and are raked out and discharged at the upper end of the classifier. The finer and lighter particles are kept in suspension by the rakes and are discharged as tailings with the excess water admitted as a surface spray at the upper end of the tank. Two views of the device are shown by the accompanying photographs.



MODEL DORR WASHER AND CLASSIFIER—SIDE VIEW

The speed of the trommel or screen is so adjusted that the material within it is subjected to a cascading action similar to the action of the material in a ball mill. The lumps of sand or gravel are carried out of the water on the side of the trommel, from which position they fall or cascade back into the water. This action continues until the material finally reaches the lower end of the trommel, where a discharge scoop, similar to the feed scoop of a ball mill, picks up the coarse washed material and discharges it, comparatively free from water, from the machine.

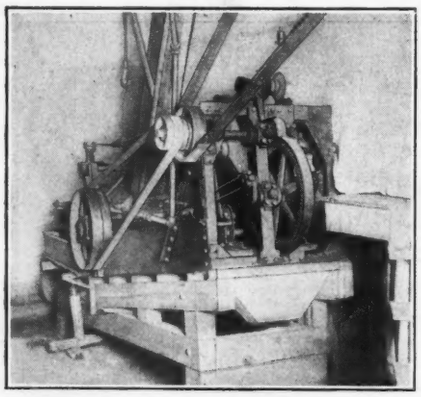
In order to carry a considerable charge of material in the trommel at all times, the slope should be very small. This has the effect of causing the particles to rub together and to wear off the soft clay or silt. The presence

of large lumps in the trommel is therefore quite desirable, in order to increase this abrasive action and thus eliminate preliminary screenings or sizing.

By placing coarse screen or grate across the trommel near the discharge end, the coarse material is retained in the trommel, thus increasing the abrasion. This is particularly desirable when the material contains a large amount of paint rock or partly disintegrated silica. The abrasive effect may be further increased by the addition of steel balls.

The power required to operate a trommel of any given dimension is proportionate to the speed and load of material that it carries. The trommel is considered as a modification of a ball mill, and by slight alterations may be made to operate as much like a ball mill as is desired.

All the parts are slow moving, and



DORR WASHER—END VIEW

records show that maintenance costs on machines handling as much as 100 tons of material per hour are exceptionally small. This is explained by the fact that a machine raking out one ton of ore per minute requires less than five horsepower for operation.

This new device is known as the Dorr Washer and Classifier, and a small model was built in the Minnesota School of Mines recently and tested by Edward W. Davis. The model is 8½ by 2 ft. in dimensions and our photographs show two views of it.

Motor Show at Delhi in 1921

A motor show will be held at Delhi, India, in February, 1921, under the auspices of the local Motor Trade Association, says *U. S. Commerce Reports* of Oct. 29, 1920. It will be open only to those firms in India which are agents or recognized subagents for motor vehicles, cycles, and accessories. A motor gymkhana will be held in connection with the show, in which there will be competitions for private owners as well as for dealers.

Italian restriction on importation of motor trucks was removed, effective Oct. 29.

Trucks Provide Power for Factory During Coal Shortage

During the recent coal shortage the Duplex Truck Company again demonstrated an unusual ability to surmount serious difficulties.

Without a steam power plant and with no electric power due to the coal shortage, the Duplex Truck Company was able to operate all departments with every man on the job.

Power for the Duplex plant was found in eight big Duplex 4-wheel drive trucks and two birds were killed with one stone because in driving the machinery the trucks were tested out and gas conserved.

Realizing that the coal situation meant a complete shut down for the Duplex plant which was facing an unprecedented demand for the new "Limited" trucks far beyond any anticipation, a serious problem was confronted.

A plan was worked out whereby eight big Duplex trucks were placed conveniently to turn line shafts and two trucks to do the work of the 50-hp. electric motors run in normal times to operate the plant.

The truck motors were driven at maximum speed under governor control. The operation of the plant was less expensive with the Duplex trucks than with the electric power.

Truck motors were given a two-day test-out and then a new motor was hooked up with the shafts. The plan worked perfectly and every Duplex employee was kept on the job.

Hauck Manufacturing Company Loses Its President

Arthur E. Hauck, President of the Hauck Manufacturing Co., maker of oil-burning appliances, Brooklyn, N. Y., died at Flatbush, Brooklyn, on Oct. 30, aged forty-one years. Mr. Hauck learned copper-smithing in Germany. Before he was twenty he followed his trade in the navy and ship yards of Belgium, France, and England. He arrived in this country when twenty years old, landing at Philadelphia, where he promptly obtained employment at the Philadelphia Navy Yard. After working for three years in the Navy's eastern coppersmithies, Mr. Hauck started in the oil-burner business in 1902 with a small shop in Brooklyn. His pioneer work was the basis for many of the industrial oil-burning devices of today. Over a score of important basic patents on oil-burning devices, as well as numerous minor inventions and improvements in the applications of burning oil, testify to his continued interest and industry. One of his principal patents is the method of vaporizing kerosene in a torch with proportioned, heat-resistant nozzle. Another is the Hauck method of atomization through proportioned pipes, openings, and composition nozzle, inducing what he termed "the internal combustion."

TRADE CATALOGS

Oil Shale Equipment—The Denver Fire Clay Co., Denver, Col., recently issued a 32-pp. bulletin, No. 251, "Oil Shale Equipment." This booklet outlines the oil-shale industry in Scotland, describes the occurrence of shales in the United States and also contains a number of illustrated methods for the preliminary or field distillation of oil shale. Description and price lists of apparatus used in this connection are also included.

Ventilation—Buffalo Forge Co., Buffalo, N. Y., illustrates and describes in its Catalog 721, various installations of its devices and systems for ventilating dyehouses and bleacheries, among which a number suggest ways in which similar devices could improve conditions in metal-working plants.

Rock Drills—The Denver Rock Drill Mfg. Co., Denver, Col., has issued a bulletin, "Waugh 'Ninety' Drills," which outlines the general specifications of this type, which has been designed for and is especially adapted to coal and iron mining. It is suitable for drilling in the softer formations where a powerful positive rotation is required, and can also be successfully applied to block-holing, hitch-cutting, trimming, or drilling in any character of rock, although not so well adapted as other drills designed for that purpose.

Detonators—Atlas Powder Co., Philadelphia, Pa., is supplying a small lightweight device for detonating that company's electric blasting caps and illustrates its advantages in a small folder. This "Davis No. 1 Blaster" is so small that it fits the average hand, but has power to fire five 30-ft. copper-wire electric caps connected in series. Advantages of electric blasting, furnished by this device, are extended to many smaller operations.

Screens—Stimpson Equipment Co., Salt Lake City, Utah, and Grand Central Palace, New York City, has issued an illustrated eighteen-page account of the Mitchell electric vibrating screen invented at Garfield, Utah. It is claimed to attain unusual efficiency with all kinds of material at very low proportionate power cost and to be practically fool-proof. Its vibrating mechanism is truly unique and peculiarly efficient.

Electric Devices—The Cutler-Hammer Manufacturing Co., Milwaukee, Wis., has collected under an attractive, two-color cover, forty-eight pages of information concerning all its products designed "For the Mine," and given the pamphlet that title. The booklet, described as Publication 836, is well illustrated and deals with motor controllers, battery-charging equipment, electrically operated brakes, solenoids, ore separators, clutches and space heaters.